Cognitive characteristics of children and adolescents with post-traumatic stress disorders.

Moradi, Ali Reza

COGNITIVE CHARACTERISTICS OF CHILDREN AND ADOLESCENTS WITH PTSD AND CHILDREN AND ADOLESCENTS OF ADULTS WITH PTSD

ALI REZA MORADI

This thesis is submitted in fulfilment of the requirements for the degree of Doctor of Philosophy in Psychology, at the Institute of Psychiatry, University of London.

June 1996

To all of the Martyrs who made a great sacrifice for Iran

particularly during eight years of holy defense

&

To their children who suffer from Post-Traumatic Stress Disorder

&

To my wife

&

To my children

ABSTRACT

Cognitive problems are among the important and common sequelae in child patients with PTSD, for example poor memory, poor concentration, intrusive thoughts and flashbacks (e.g., Yule, &Gold 1993; Last; 1993). In recent years, investigators have started to study these functions in adults with PTSD, but they have yet to be investigated in young people with PTSD. Therefore, following extensive investigations of cognitive processing in adults with anxiety disorder including PTSD, it is proposed to apply some of these paradigms to investigate PTSD in children.

Chapter One presents a general introduction describing the background to the work and an outline of the proposed studies. Chapter Two describes the concept of PTSD, phnomenology, classification of PTSD and PTSD in children and finally three non-cognitive theories of PTSD. Two basic concepts of cognition i.e. memory and attention are described in Chapter Three. Cognitive theories of emotional disorders especially that of Williams et al. (1988) and cognitive models of PTSD are presented. Chapter Four describes how a dictionary of emotional words was developed and a list of different types of emotional words was created.

In the first experiment in Chapter 5, young people with PTSD, children of adults with PTSD and normal subjects, participated in a colour naming task. The task consisted of 5 categories of words: threat-related depressed-related, trauma-related, positive and neutral words which appeared randomly, one after the other on the screen of a computer in four different colours three times. The results indicated that the PTSD patients had a greater interference toward trauma-related words than other types of words compared to the control group. Children of adults with PTSD showed an attentional bias towards trauma-related and threat-related words.

Chapter Six describes a second experiment on attention with children with PTSD. Four types of words -physical threat, social threat, depressed and neutral words- were presented to the subjects one after the other. The subjects were asked to press a button

when they saw a dot on the screen of the computer. The results showed that the PTSD patients shifted their attention towards threat words, while their attention shifted away from depressed words.

Chapter Seven describes an investigation on recall and recognition with young people with PTSD and children of adults with PTSD compared with controls. The findings indicated that PTSD patients generally recalled fewer words than controls which confirmed poor memory in young people with PTSD, but both experimental groups did not show any memory bias towards a particular type of emotional words on the recall or recognition task.

Chapter Eight compared the findings of PTSD and controls' performance on the Rivermead Behavioural Memory Test (Wilson et.al., 1990, RBMT). PTSD patients showed a poor memory performance on this task compared with normal subjects. They particularly had impairment in prospective items (those items which related to the future), story immediate and delayed recall and orientation.

A final chapter presents a full discussion of the results of the emprical studies and discusses possible implications for future research.

CONTENTS

TITLE PAGE 1

DEDICATION 2

ABSTRACT 3

CONTENTS 5

FIGURES 25

TABLES 28

ACKNOWLEDGMENTS 37

CHAPTER 1 GENERAL INTRODUCTION: BACKGROUND AND PROPOSED STUDIES 38

CHAPTER 2: POST-TRAUMATIC STRESS DISORDER (PTSD): IMPORTANT CONCEPTS, CLINICAL PTSD ASPECTS, IN CHILDREN AND ADOLESCENTS

2.1. Historical views of PTSD 46

2.2. The concept of PTSD 47

2.3. PTSD criteria in DSM-IV and ICD-10 47

- 2.3.1. PTSD in DSM-IV 48
- 2.3.2. PTSD in ICD-10 49

2.4. Phenomenology of PTSD 50

- 2.4.1. Duration 50
- 2.4.2. Classification of PTSD 50
  - 2.4.2.1. PTSD as an anxiety disorder 51
  - 2.4.2.2. PTSD as a dissociative disorder 51
- 2.4.3. Biological and physiological studies 53
  - 2.4.3.1. Neuropsychology of PTSD 54
  - 2.4.3.2. Laterality of cereberal hemispheres 56

2.5. PTSD in children and adolecents 57

- 2.5.1. PTSD symtomatology in children and adolescents 57

2.5.2. Epidemiology 59
2.5.3. Developmental considerations 60
2.5.3.1. Neurodevelopmental factors 61
2.5.3.2. Premorbid history 61
2.5.3.3. Sex 62
2.5.3.4. Family factors 62
2.5.3.5. School factors 62
2.5.4. Assessment of PTSD in children and adolescents 63
2.5.4.1. Self-Report measures 63
2.5.4.1.1. Impact of Event Scale (IES) 63
2.5.4.2. Structured Interviews 64
2.5.4.2.1. The Children's PTSD Reaction Index 64
2.5.4.2.2. Children's PTSD Inventory 64
2.5.4.2.3. Clinical-Administered PTSD Scale (CAPS) 65
2.6. Theories of PTSD 65
2.6.1. Psychodynamic theories 66
2.6.1.1 Janet's theory 66
2.6.1.2. Freud's theory 66
2.6.2. Mowrer's two factor theory 67
2.6.3. The twofold developmental model of Childhood Traumatic Stress 68
2.6.3.1. Traumatic reminders 70
2.6.3.2. Proximal stress-related psychopathology 71
2.7. Summary and conclusions 72

CHAPTER 3: COGNITION AND EMOTION 74
3.1. Introduction 74
3.2. Attention 75
3.3. Memory 78
3.3.1. Stages of Memory 78

3.3.1.1. Encoding 78
3.3.1.2. Storage 78
3.3.1.3. Retrieval 79
3.3.2. Classification of memory 79
3.3.2.1. Declarative memory 79
3.3.2.1.1. Episodic memory 79
3.3.2.1.2. Semantic memory 79
3.3.2.1.3. Recall and Recognition 80
3.3.2.2. Nondeclarative memory 82
3.3.2.2.1. Priming 82
3.3.2.2.2. Procedural memory 83
3.3.2.3. Everyday memory 83
3.3.3. Memory and emotion 84
3.4. Theories of emotional disorders 85
3.4.1. Beck's Schema theory 86
3.4.2. Bower's network model of emotion and cognition 90
3.4.3. The cognitive model of Williams et al. 93
3.4.4. Lang's theory 96
3.5. Cognitive models of PTSD 97
3.5.1. Horowitz' information processing model 98
3.5.2. Janoff-Bulman theory 100
3.5.3. Foa et al.'s fear network theory 101
3.5.4. The cognitive processing theory of Creamer et al. 103
3.5.5. Brewin et al.'s Dual representation theory 105
3.6. Summary and conclusion 106

CHAPTER 4: THE DEVELOPMENT OF A CORPUS OF EMOTIONAL WORDS PRODUCED BY CHILDREN AND ADOLESCENTS 108
4.1. Introduction 108
4.2. Method 109
4.2.1. Subjects 109

4.2.2. Measures 109
4.2.3. Pilot Studies 111
4.2.4. Procedure 111
4.2.5. Modification of collected words 111
4.3. Results 112
4.3.1. School effect (Primary vs. Secondary) 114
4.3.2. Age effect 115
4.3.4. Sex effect 117
4.4. Discussion 120
4.5. Development of PTSD words 120

CHAPTER 5: THE PERFORMANCE OF CHILDREN WITH PTSD ON A COLOUR-NAMING TASK (THE MODIFIED STROOP PARADIGM) 122
5.1. Introduction 122
5.2. What is the Stroop task 122
5.3. Stroop interference in adults with anxiety disorders 125
5.3.1. The Stroop effect in subjects with generalised anxiety disorder 125
5.3.2. The Stroop effect in adult subjects with other anxiety disorders (except PTSD) 128
5.4. Emotional Stroop effect in depressed adults 130
5.5. Stroop interference in adults with PTSD 133
5.6. Stroop interference in children 136
5.7. Purpose of research 137
5.8. Investigation of Stroop performance in children with PTSD 137
5.8.1. Hypothesis 137
5.8.2. Design 137
5.8.3. Method 138
5.8.3.1. Subjects 138
5.8.3.2. Materials 138
5.8.3.2.1. Instrumentation 138

5.8.3.2.2. Stroop words 139
5.8.3.2.3. Psychological measures 139
5.8.3.3. Procedure 141
5.8.4. Results 143
5.8.4.1. Subject characteristics 143
5.8.4.2. Colour-naming reaction times 143
5.8.4.3. Differential idex 146
5.8.4.4. Type of trauma effect 148
5.8.4.5. Preliminary developmental analyses 151
5.8.4.5.1. Children (under 13 years old) 151
5.8.4.5.2. Adolescents (over 13 years old) 153
5.8.4.6. Sex effect 155
5.8.4.7. Correlational analyses 157
5.8.5. Preliminary discussion 159
5.9. Emotional Stroop effects in children of adults with PTSD 160
5.9.1. Introduction 160
5.9.2. Hypothesis 161
5.9.3. Subjects 161
5.9.4. Results 162
5.9.4.1. Subject characteristics 162
5.9.4.2. Colour-naming reaction times 193
5.9.4.3. Preliminary developmental analyses 166
5.9.4.3.1. Children (under 13 years old) 166
5.9.4.3.2. Adolescents (over 13 years old) 168
5.9.4.4. Sex effect 169
5.9.4.5. Correlational analyses 171
5.10. Comparison between children with PTSD and children of adults with PTSD 173
5.10.1. Subject characteristics 173
5.10.2. Colour-naming reaction times 173
5.11. Discussion 176

CHAPTER 6: AN INVESTIGATION OF ATTENTIONAL BIAS IN CHILDREN AND ADOLESCENTS WITH PTSD USING THE PROBE DOT TASK

6.1. Introduction 181

6.2. Probe dot interference in adults with anxiety disorders 182

6.3. Attentional probe dot interference in sub-clinical anxious subjects 184

6.4. Visual attentional bias in depressed individuals using an attention deployment task 187

6.5. Attentional bias in children and adolescents using the attentional probe dot task 189

6.6. Experiment 191

6.6.1. Hypothsis 191

6.6.2.Method 192

6.6.2.1. Design 192

6.6.2.2. Subjects 192

6.6.3. Materials 192

6.6.3.1. Instrumentation 193

6.6.3.2. Task presentation 194

6.6.3.3. Psychological measures 194

6.6.4. Procedure 195

6.6.5. Results 196

6.6.5.1. Subject characteristics 196

6.6.5.2. Performance on the attentional deployment task 197

6.6.5.3. Analyses involving indices 199

6.6.5.4. Analyses of threat position and probe position 203

6.6.5.5. Type of trauma effect 204

6.6.5.6. Preliminary developmental analyses 207

6.6.5.6.1. Children (under 13 years old) 207

6.6.5.6.2. Adolescents (over 13 years old) 208

6.6.5.7. Sex effect 209
6.6.5.8.Correlational analyses 211
6.6.6. Discussion 213

CHAPTER 7: RECALL AND RECOGNITION MEMORY PERFORMANCE IN CHILDREN AND ADOLESCENTS WITH POST-TRAUMATIC STRESS DISORDER
7.1. Introduction 217
7.2. Memory bias in adults with anxiety 219
7.3. Memory biases in adults with depression 223
7.4. Memory performance in adults with PTSD 227
7.5. Memory bias in children 229
7.6. Purpose of research 232
7.7.Experiment 1: Rcall and recognition memory performance in children and adolescents with post-traumatic stress disorder 233
7.7.1. Hypothesis 233
7.7.2. Design 233
7.7.3. Method 233
7.7.3.1. Subjects 233
7.7.3.2. Materials 234
7.7.3.2.1. Psychological measures 234
7.7.3.2.2. Memory words 234
7.7.3.2.3. Instrumentation 234
7.7.4.Procedure 235
7.7.4.1. Adminstration of the recall test 235
7.7.4.2. Adminstration of the recognition test 236
7.7.5. Results 236
7.7.5.1. Subject characteristics 236
7.7.5.2. Results of the recall test 237
7.7.5.3. Differential index 240

7.7.5.4. Results of the recognition test 242
7.7.5.5. ***d'*** analyses 244
7.7.5.6. ***Beta*** analyses 247
7.7.5.7. Type of trauma effects 247
7.7.5.8. Developmental analyses 251
7.7.5.9. Sex effect 254
7.7.5.10. Correlational analyses 256
7.8. Experiment 2: Memory bias (recall and recognition effects) in children of adults with post-traumatic stress disorder 260
7.8.1. Hypothesis 260
7.8.2. Method 260
7.8.3. Subjects 261
7.8.4. Results 261
7.8.4.1. Subjects characteristics 261
7.8.4.2.Results of the free recall test 262
7.8.4.3. Results of the recognition test 265
7.8.4.4. ***d'*** analyses 266
7.8.4.5. ***Beta*** analyses 268
7.8.4.6. Correlational analyses 268
7.9. Comparison across three groups: Children with PTSD, children of adults with PTSD and normal controls 275
7.10. Discussion 274

CHAPTER 8: MEMORY DEFICITS IN CHILD PATIENTS WITH PTSD (PERFORMANCE ON THE RIVERMEAD BEHAVIOURAL MEMORY TEST)
8.1. Introduction 279
8.2. Neuropsychological research on adults with PTSD 279
8.3. Memory deficits in children with PTSD 286
8.4. Purpose of research 286
8.5. Hypothesis 287

8.6. Subjects 287
8.7. Materials 287
8.7.1. Psychological measures 287
8.7.2. Rivermead Behavioural Memory Test 288
8.7.2.1. The Standardised profile score 290
8.7.2.2. Interpretation of the scores 291
8.8. Procedure 292
8.9. Results 292
8.9.1. Subject characteristics 292
8.9.2. RBMT data 293
8.9.2.1. First name and Second name 296
8.9.2.2.Face Recognition 296
8.9.2.3. Route Immediate Delayed 296
8.9.2.4. Picture Recognition 296
8.9.2.5. Story Recall (Immediate and Delayed) 297
8.9.2.6. Orientation 297
8.9.2.7. Date 299
8.9.2.8. Prospective Items (Appointment, Belonging,and Message Delivery 299
8.9.2.9. Total Standardised Profile Score 303
8.9.2.10. Type of trauma effect 305
8.9.2.11. Preliminary developmental analyses 306
8.9.2.11.1. Children (under 14 years old) 306
8.9.2.11.2. Adolescents (over 14 years old) 307
8.9.2.12. Sex effect 309
8.9.2.13. Correlational analyses 311
8.10. Discussion 312

CHAPTER 9: GENERAL DISCUSSION
9.1. Introduction 317
9.2. Cognitive features of children and adolescents with PTSD 318

9.2.1. Attentional bias 318

9.2.2. Memory bias 323

9.2.3. Comparison with anxious and depressed children's findings 325

9.2.4. Implication for processes underlying treatment 327

9.2.5. Memory deficits in children with PTSD 329

9.3. Further lines of research 332

9.4. Summary 333

REFERENCES 334

APPENDICES

Appendix 4.1 Emotional Word Generation Questionnaire. 379

Appendix 4.2 Differences between the two groups on producing words in other categories: semantically related neutral words (animals), semantically unrelated neutral words, positive self-descriptive adjectives, happy feelings, happy things, and scary feelings. 379

Appendix 4.3 The differences were not significant in 4 categories: semantically unrelated neutral words; happy feelings; scary feelings; and sad things. 379

Appendix 4.4 The number of words produced by the three groups in the 4 categories: semantically related neutral words (animals); positive self-descriptive adjectives; happy feelings; and happy things. 380

Appedix 4.5 The differences were not significant in two categories: happy feelings and scary feelings. 380

Appendix 4.6 The 25 most frequently generated words. 381

Appendix 4.7 Lists of trauma-related words 394

Appendix 5.1 Words used in the Stroop Task 398

Appendix 5.2 Differences between PTSD patients and normal controls on age, verbal IQ, and reading ability. 398

Appendix 5.3 ANOVAs of colour-naming times for depressed words, happy words, and threat words relative to neutral words in the PTSD group. 398

Appendix 5.4 Main effect of Group, and Index Type for differential Index analysis across PTSD patients and controls. 398

Appendix 5.5 The results of paired sample t-test across all PTSD Patients between the indices of happy words and sad words, happy words and threat words, trauma-related words and depressed words, and depressed words and threat words. 399

Appendix 5.6 Differences between RTA and PV groups on verbal IQ, reading ability, RCMAS anxiety score, total score of IES, Intrusion sub-scale of IES, and Avoidance sub-scale of IES. 399

Appendix 5.7 Main effect of Group, and interaction for colour-naming times across RTA and PV subjects. 399

Appendix 5.8 Differences between PTSD and control children (under 13 years) on age, verbal IQ, reading ability, and RCMAS anxiety score. 399

Appendix 5.9 The main effects of Group, and Word Type for colour-naming times across PTSD and control children (under 13 years). 399

Appendix 5.10 The results of paired sample t-test across children control subjects between neutral words and depression-related words, neutral and happy words, neutral and trauma-related words, neutral and threat words, between depressed words and happy words, depressed words and threat words, and between happy and threat words.

Appendix 5.11 Differences between PTSD and control adolescents on age, verbal IQ, and reading ability. 399

Appendix 5.12 The results of paired sample t-test across adolescents with PTSD between neutral words and depression-related words, neutral and happy words, neutral and threat words, between depressed words and happy words, depressed words and trauma-related words, depressed words and threat words, between happy words and trauma-related words, and between happy and threat words. 400

Appendix 5.13 Differences between boys and girls with PTSD on age, verbal IQ, DSRS depression score, RCMAS anxiety score, total scores on the IES, scores on the intrusion sub-scale of IES. 400

Appendix 5.14 The main effct of Group, and interaction across boys and girls with PTSD. 400

Appendix 5.15 The results of paired sample t-test across all PTSD 400 patients between neutral words and depression-related words, neutral and happy words, neutral and threat words, between depressed words and happy words, depressed words and trauma-related words, depressed words and threat words, and between happy and threat words.

Appendix 5.16 Differences between children of adults with PTSD and controls on age, verbal IQ, reading ability, and RCMAS anxiety score. 401

Appendix 5.17 ANOVAs comparing RTs to colour-name neutral words and happy words, and depressed words across children of adults with PTSD. 401

Appendix 5.18 Differences between children of adults with PTSD and controls (under 113 years) on age, verbal IQ, reading ability, RCMAS anxiety scores, and DSRS depression scores. 402

Appendix 5.19 The main effect of Group, and Word Type for colour-naming times of children of adults with PTSD and controls (aged under 3 years). 402

Appendix 5.20 The results of paired sample t-tests across children of adults with PTSD between neutral words and depression-related words, neutral and happy words, neutral words and trauma-related words, neutral and threat words, between depressed words and happy words, depressed words and trauma-related words, happy and trauma-related words, and between trauma-related words and threat words. 402

Appendix 5.21 The results of paired sample t-tests across children 402 control subjects between neutral words and depression-related words, neutral and happy words, neutral and trauma-related words, neutral and threat words, between depressed words and happy words, depressed words and threat words, and between happy and threat words.

Appendix 5.22 Differences between children of adults with PTSD and controls (aged over 13 years) on age, verbal IQ, reading ability, and RCMAS anxiety scores. 402

Appendix 5.23 The main effect of Group, interaction, and Word Type for children of adults with PTSD and controls (aged over 13 years). 402

Appendix 5.24 Differences between boys and girls of adults with PTSD on age, verbal IQ, RCMAS anxiety scores, and reading ability. 402

Appendix 5.25 The results of paired sample t-tests across all children of adults with PTSD between neutral words and depression-related words, neutral and happy words, between depressed words and trauma-related words, depressed words and threat words, and between trauma-related words and threat words. 402

Appendix 5.26 Differences between children with PTSD, children of adults with PTSD, and normal controls on age, verbal IQ, and reading ability. 403

Appendix 6.1 - Physical threat, Social threat, and Depressed words used in the attentional probe dot task. 404

Appendix 6.2 Differences between PTSD and normal control subjects on age, verbal IQ , and reading ability. 405

Appendix 6.3 Main effect of Group, and Word Type effect between PTSD patients and controls for social threat and physical threat. 405

Appendix 6.4 The results of separate ANOVASs for social threat vs. physical threat words across PTSD and control subjects. 405

Appendix 6.5 Main effect of Group, and Word Type effect for physical threat vs. depressed words across PTSD patients and controls. 405

Appendix 6.6 Main effect of Group, and Word Type effect for social threat vs. depressed words across PTSD patients and controls. 405

Appendix 6.7 Two way interaction for Group X Word Type, Threat Position X Word Type, for Word Type X Probe Position. Three way interaction for Group X Word Type X Probe, for word position X Group X Probe. 405

Appendix 6.8 Differences for word type, word position, probe position, word x word position, word x probe position, and word position x probe position across PTSD patients. Differences for word type, word position, probe position, word x word position, word x probe position, word position x probe position, and word x word position x probe position across control subjects.Differences for word position, probe position across PTSD patients when deconstructing the trend for three way interaction. 405

Appendix 6.9 Differences between two subgroups of patients (RTA & PV) on verbal IQ, reading ability, RCMAS anxiety scores, total scores of IES [F(1, 21) = 0.505, P = 0.48], intrusion subscale of IES, and avoidance subscale of IES. 406

Appendix 6.10 The results of main effect of Group, interaction, and Word Type effect for two subgroups of patients (i.e RTA & PV). 406

Appendix 6.11 Differences between two groups of children aged under 13 years) on age verbal IQ, reading ability, anxiety Scale, or depression Scale. 406

Appendix 6.12 Main effect of Group and Word Type effect for threat bias and depressed bias across subjects under 13 years old. 407

Appendix 6.13 Differences on psychological measures across subjects over 13 years old on age, verbal IQ, and reading ability. 407

Appendix 6.14 Main effect of Group, interaction, and Word Type effect for threat bias scores and depressed bias scores across two groups of subjects over 13 years old. 407

Appendix 6.15 Differences on psychological measures for age, verbal IQ, DSRS depression scores, RCMAS anxiety scores, total scores of IES, and intrusion subscale of IES across boys and girls with PTSD. 407

Appendix 6.16 Main effect of Group, interaction, and Word type effect for threat bias and depressed bias across boys and girls with PTSD. 407

Appendix 7.1 List of Recall Words, and list of the Buffer Words for Recognition task. 408

Appendix 7.2 Differences between two groups (PTSD patients & controls) on age, verbal IQ, and reading ability. 409

Appendix 7.3 Main effect of Group, and interaction for Beta value between PTSD patients and normal controls. 409

Appendix 7.4 Differences between two sub-group of PTSD patients (RTA & PV) on verbal IQ, reading ability, total score of the Impact of event scale, avoidance sub-scale of the IES, and intrusion sub-scale of the IES. 409

Appendix 7.5 Main effect of Group and interaction for recalled words between two sub-groups of PTSD patients involved in RTA or PV. 410

Appendix 7.6 Main effect of Group and interaction for d' value across two sub-groups of PTSD (RTA & PV). Main effect , interaction, and Word Type effect for Beta value across two sub-groups of PTSD (RTA & PV). 410

Appendix 7.7 Differences between the two groups (aged under 13 years) on age, verbal IQ, reading ability, and RCMAS anxiety score. 410

Appendix 7.8 Differences between the two groups (aged over 13 years) on age, vebal IQ, and reading ability. 410

Appendix 7.9 Main effect of Group, and interaction for recall memory across PTSD patients and normal controls (aged under 13 years). 410

Appendix 7.10 Main effects of Group for ***d'***, or ***Beta***, and interaction for ***d'*** or ***Beta***, or Word Type effect for ***Beta*** values across PTSD and normal controls under 13 years old. 410

Appendix 7.11 Main effect of Group for ***d'***, for ***Beta*** values, interaction for ***d'*** and for ***Beta*** across adolescents with PTSD and controls. 411

Appendix 7.12 Differences between girls and boys on age, verbal IQ, depression scores. 411

Appendix 7.13 Main effect of and interaction for boys and girls with PTSD. 411

Appendix 7.14 Main effect for ***d'***, for ***Beta***, and interaction for ***d'*** and for ***Beta*** values across boys and girls with PTSD. 411

Appendix 7.15 Differences between children of adults with PTSD and controls on age, verbal IQ, reading ability, and anxiety scale. 411

Appendix 7.16 Differences between children of adults with PTSD and controls of false memory, and total memory. 411

Appendix 7.17 Main effect of and interaction on recall memory between children of adults with PTSD and normals. 411

Appendix 7.18 Main effect of and interaction for ***d'*** value between children of adults with PTSD and controls. 412

Appendix 7.19 Main effect of and interaction for Beta value between children of adults with PTSD and controls. 412

Appendix 7.20 Main effect of and interaction on the recalled words for children with PTSD, children of adults with PTSD and controls. 412

Appendix 7.21 Main effects of Group for ***d'*** and ***Beta*** and interactions for ***d'*** and ***Beta*** values across three groups: Children with PTSD, children of adults with PTSD and normal controls.

Appendix 8.1 Differences between PTSD patients with RTA and PV trauma on verbal IQ, reading ability, IES, avoidance, intrusion, or anxiety. 413

Appendix 8.2 Differences between PTSD patients with RTA and PV trauma on appointment, belonging, date, face recognition, first name and second name, message delevery, orientation, picture recognition, prospective, route delayed, route immediate, story delayed, story immediate, and total score. 413

Appendix 8.3 Differences between PTSD patients and controls (aged under 14 year) on age, self report anxiety, verbal IQ, depression, and reading ability. 413

Appendix 8.4 Differences between PTSD patients and controls (aged under 14 year) on appointment, belonging, date, first name and second name, orientation, picture recognition, prospective, route delayed, route immediate, story delayed.

Appendix 8.5 Differences between PTSD patients and controls (aged over 14 year) on age, and verbal IQ. 413

Appendix 8.6 Differences between PTSD patients and controls (aged over 14 year) on date, face recognition, first name and second name, orientation, picture recognition, route delayed, route immediate, story delayed and story immediate. 414

Appendix 8.7 Differences between boys and girls with PTSD on age, anxiety , verbal IQ , reading ability, depression , IES, 414 avoidance, and intrusion.

Appendix 8.8 Differences between boys and girls with PTSD on belonging, date, face recognition, first name and second name, message delevery, orientation, picture recognition, route delayed, route immediate, story delayed, story immdiate, and total score. 414

Appendix 8.9 Differences between boys and girls with PTSD on belonging, date, face recognition, first name and second name, message delevery, orientation, picture recognition, route delayed, route immediate, story delayed, story immediate, and total score. 414

FIGURES

CHAPTER FOUR

Figure 4.1 The distribution of words produced by subjects in different categories. 114

Figure 4.2. The distribution of words produced by primary and secondary school students. 115

Figure 4.3 Mean numbers of words produced by 3 age groups 117

Figure 4.4 Mean numbers of words in different categories produced by girls and boys. 118

CHAPTER FIVE

Figure 5.1 Mean reaction times on the Stroop colour-naming task for PTSD patients and controls. 145

Figure 5.2 Interference indices on the Stroop in colour-naming task for PTSD patients and controls. 147

Figure 5.3. Mean reaction times on the Stroop colour-naming task for road traffic accident (RTA) and personal violence (PV) victims. 150

Figure 5.4 Mean reaction times on colour-naming task for children of adults with PTSD (CH.PTSD) and controls. 165

Figure 5.5. Mean reaction times on the Stroop colour-naming task for children with PTSD, children of adults with PTSD and normal control subjects. 175

CHAPTER SIX

Figure 6.1 Differences on threat bias vs. depressed bias across PTSD patients and control on the attentional deployment task. 201

Figure 6.2 Differences on social threat and physical threat biases across PTSD patients and normal controls on the attentional deployment task. 202

Figure 6.3 Differences on threat bias vs. Depressed bias across two sub-groups of PTSD patients i.e. road traffic accident and personal violence on the attentional deployment task. 206

CHAPTER SEVEN

Figure 7.1 Mean numbers of recalled words across categories by PTSD patients and normal control subjects. 238

Figure 7.2 The differential indices of recalled emotional words in PTSD patients and normal control subjects. 241

Figure 7.3 ***d'***values across words categories for PTSD patients and normal control subjects. 245

Figure 7.4 ***Beta*** values across words categories for PTSD patients and normal control subjects. 246

Figure 7.5 Mean numbers of recalled words by the two sub-groups of PTSD patients i.e. road traffic accident and personal violence. 250

Figure 7.6 Mean numbers of recalled words by children of adults with PTSD and normal control subjects. 264

Figure 7.7 ***d'*** values across words categories for children of adults with PTSD and normal controls. 267

Figure 7.8 ***Beta*** values across words categories for children of adults with PTSD and normal control subjects. 269

CHAPTER EIGHT

Figure 8.1 Mean of standardised profile scores for all subjects on the Rivermead Behavioural Memory Test items (RBMT). 295

Figure 8.2 Mean standardised profile scores for PTSD patients and normal controls on Story Recall. 298

Figure 8.3 Raw scores for PTSD patients and normal controls on the Orientation items of the Rivermead Behavioural Memory Test. 300

Figure 8.4 Mean standardised profile scores on the Prosepective Memory items for PTSD patients and normal controls. 302

Figure 8.5 Mean total standardised profile scores on the Rivermead Behavioural Memory Test (RBMT) for PTSD patients and normal control subjects. 304

TABLES

CHAPTER FOUR

Table 4.1 Number of subjects in primary and secondary schools, means of age in years and standard deviations (SD). 109

Table 4.2 Means and standard Deviations (S.Ds) of the numbers of words produced by primary and secondary school students. 113

Table 4.3 The summary of findings. 119

Table 5.1 Means and standard deviations (SD) of psychological measures for PTSD subjects and controls. 143

Table 5.2 Means and standard deviations (SD) of colour naming response latencies (sec.) for neutral (animal), happy, threat, depressed and Trauma-related words. 144

Table 5.3 Means and standard deviations (SD) of psychological scales for the two sub-groups of PTSD patients (i.e. RTA & PV). 148

Table 5.4 Means and standard deviations (SD) of colour-naming response latencies (sec.) for neutral (animal), happy, threat, sad and trauma(PTSD) words across two sub-groups (i.e. RTA & PV). 149

Table 5.5 Means and standard deviations (SD) of psychological measures for the two child sub-groups 1, i.e. PTSD and normal subjects(aged under 13 years old). 151

Table 5.6 Means and standard deviations (SD) of colour naming 152
response latencies (sec.) for neutral (animal), happy, threat,

depressed and trauma (PTSD) words across the two child sub-groups (i.e. PTSD and controls aged under 13 years).

Table 5.7 Means and standard deviations (SD) of psychological measures for the adolescent sub-groups, i.e. PTSD and normal subjects (aged over 13 years old). 153

Table 5.8 Means and standard deviations (SD) of colour naming response latencies (sec.) for neutral (animal), happy, threat, depressed and trauma (PTSD) words across the two child sub-groups (i.e. PTSD and controls aged over 13 years old). 154

Table 5.9 Means and standard deviations (SD) of psychological measures for boys and girls with PTSD. 155

Table 5.10 Means and standard deviations (SD) of colour-naming response latencies (sec.) for neutral (animal), happy, threat, depressed and trauma (PTSD) words across two sub-groups of PTSD patients (i.e. girls & boys). 156

Table 5.11 Correlations between psychological measures and interference times for emotional words across all subjects. 157

Table 5.12 Correlations between scores IES including Avoidance and Intrusion Subscales & interference time for emotional words across PTSD patients. 158

Table 5.13 Partial correlations between psychological measures and interference times for controlling those measures across all subjects. 158

Table 5.14 Means and standard deviations (SD) of psychological measures for children of adults with PTSD and control subjects. 163

Table 5.15. Mean and standard deviations (SD) of colour naming response latencies (sec.) for neutral (animal), happy, threat, depressed & trauma-related words across the two groups i.e. children of adults with PTSD and controls. 164

Table 5.16 Means and standard deviations (SD) of psychological measures for children of adults with PTSD and normal subjects (aged under 13 years old). 166

Table 5.17. Means and standards deviations (SD) of colour naming response latencies (sec.) for neutral (animal), happy, threat, depressed & trauma-related words across the two groups i.e. children of adults with PTSD and controls aged under 13 years. 167

Table 5.18 Means and standard deviations (SD) of psychological measures for children of adults with PTSD and normal subjects (aged over 13 years old). 168

Table 5.19. Means and standard deviations (SD) of colour naming response latencies (sec.) for neutral (animal), happy, threat, depressed & trauma-related words across the two groups i.e. children of adults with PTSD and controls aged over 13 years. 169

Table 5.20 Means and standard deviations (SD) of psychological measures for boys and girls of adults with PTSD. 170

Table 5.21. Means and standard deviations (SD) of colour naming response latencies (sec.) for neutral (animal), happy, threat, depressed & trauma-related words across girls and boys of 170

children of adults with PTSD.

Table 5.22 Correlations between psychological measures and interference times for emotional words across Children of adults with PTSD and normal subjects. 172

Table 6.1 Mean and standard deviations (SD) of psychological measures for PTSD and controls. 197

Table 6.2 Means and standard deviations (SD) of probe detection latencies for threat words (physical threat + social threat /2) in sec. 198

Table 6.3 Means and standard deviations (SD) of probe detection latencies for depressed words in sec. 198

Table 6.4 Means and standard deviations (SD) of bias indices for different types of words in sec (threat bias = social bias + physical bias / 2). 198

Table 6.5 Means and standard deviations (SD) of psychological measures for two sub-groups of PTSD i.e. RTA & PV 205

Table 6.6 Means and standard deviations (SD) of psychological measures for PTSD and controls (aged under 13 years old) 207

Table 6.7 Means and standard deviations (SD) of biases in sec. for PTSD & control (aged under 13 years) (threat bias = social bias + physical bias / 2) 208

Table 6.8 Means and standard deviations (SD) of psychological measures for PTSD and controls (aged over 13 years old) 209

Table 6.9 Mean and standard deviations (SD) of biases in sec. for PTSD and controls (aged over 13 years) (Threat bias = social bias + physical bias / 2) 209

Table 6.10 Means and standard deviations (SD) of psychological measures for boys and girls with PTSD 210

Table 6.11 Means and standard deviations (SD) of biases in sec. for boys and girls with PTSD (threat bias = social bias + physical bias / 2). 211

Table 6.12 Correlations between psychological measures and biases across all subjects i.e. PTSD patients and normal controls. 212

Table 6.13 Correlations between IES & Biases of emotional words across PTSD patients. 212

Table 7.1 Means and standard deviations (SD) of subject characteristics in the recall task. 237

Table 7.2 Means and standard deviations of recalled words by PTSD and normal control subjects. 239

Table 7.3 Proportions of hit rate (HR) and false alarms (FA) for PTSD and control subjects in the recognition memory test. 243

Table 7.4 Means and standard deviations (SD) of ***d'*** and ***Beta*** values for PTSD patients and normal control subjects. 244

Table 7.5 Means and standard deviations (SD) of psychological measures for two sub-group of PTSD patients (RTA: road traffic accident 248 and PV: personal violence).

Table 7.6 Means and standard deviations (SD) of recalled words by two sub-groups of PTSD patients (RTA: road traffic accident & PV: personal violence). 249

Table 7.7 Means and standard deviations (SD) of psychological measures for PTSD and normal subjects (aged under 13 years old). 252

Table 7.8 Means and standard deviations (SD) of psychological measures for PTSD and normal subjects (aged over 13 years old). 252

Table 7.9: Means and standard deviations (SD) of psychological measures for boys and girls with PTSD. 255

Table 7.10 Correlations between psychological measures and number of the recalled words across all subjects. 257

Table 7.11 Correlations between scores IES Impact of Event Scale including Avoidance and Intrusion Subscales & number of the recalled words across PTSD patients. 258

Table 7.12 Partial correlations between psychological measures and number of the recalled words, controlling for those measures across all subjects. 258

Table 7.13 Correlations between psychological measures and ***d'*** value across all subjects. 259

Table 7.14 Correlations between psychological measures and ***Beta*** value across all subjects. 260

Table 7.15 Means and standard deviations (SD) of the psychological scales for children of adults with PTSD (CH.PTSD) and normal control subjects. 262

Table 7.16-Means and standard deviations (SD) of the recalled words by children of adults with PTSD (CH.PTSD) and normal control subjects. 263

Table 7.17 Proportions of hit and false alarms for children of adults with PTSD (CH.PTSD) and control subjects in the recognition memory test. 265

Table 7.18 Means and standard deviations (SD) of d' and Beta values for children of adults with PTSD (CH.PTSD) and normal control subjects. 266

Table 7.19 Correlations between psychological measures and numbers of recalled words across all children of adults with PTSD and normal controls. 270

Table 7.20 Correlations between psychological measures and ***d'*** value across all subjects. 271

Table 7.21 Correlations between psychological measures and ***Beta*** value across all subjects. 272

Table 8.1 Standardised Profile Scoring for the RBMT (Raw Scores are indicated in the body of the table). 291

Table 8.2 Cut - off points for level of memory function on the RBMT for 11 - 14 year old children (Wilson et al., 1991). 292

Table 8.3 Cut - off points on the RMBT for adults from 16 - 69 years (Wilson et al., 1989). 292

Table 8.4 Means and standard deviations (SD) of the psychological measures for PTSD patients and controls. 293

Table 8.5 Means Scores (M) and Standard Deviations (SD) for Control subjects and PTSD Patients on the Rivermead Behavioural Memory Test (RBMT). 294

Table 8.6 Distribution of scores with respect to standardised RBMT memory levels among PTSD patients and normal control subjects. 303

Table 8.7 Cumulative percentage distributions of the total standard profile and screening scores for the RBMT in the two groups (PTSD & controls). 305

Table 8.8 Means and standard diviations (SD) of psychological scales for the two sub-groups of PTSD patients (i.e. RTA & PV). 306

Table 8.9 Means and standard deviations (SD) of psychological measures for the two child sub-groups 1, i.e. PTSD and normal subjects (aged under 14 years old). 307

Table 8.10 Means and standard deviations (SD) of psychological measures for the adolescent sub-groups, i.e. PTSD and normal subjects (aged over 14 years old). 308

Table 8.11 Means Scores (M) and Standard Deviations (SD) for PTSD and controls adolescents on the Rivermead Behavioural 309

Memory Test (RBMT).

Table 8.12 Means and standard deviations (SD) of psychological measures for boys and girls with PTSD. 310

Table .8.13 Correlations between psychological measures and total memory and pospective memory scores across all subjects. 311

Table 8.14 Correlations between IES & Total and prospective memory scores across PTSD patients. 311

ACKNOWLEDGEMENTS

My thanks go to Prof. William Yule my supervisor and to Dr Tim Dalgleish my co-supervisor for their tireless and thoughtful supervision of this project and all of their kindness during my PhD, to Prof. Jeffrey Gray for his help in managing the project, to Dr. Derek Bolton for allowing me to see the patients under his care, to Dr. Andrew Mathews for his advice and comments on some methodological and theoretical points, to Mr Les law for his writing of the computerised programmes, and to Eric Glover and Charlie Sharp for advice on matters computational.

I would also like to thank my friends and colleagues, Mohammad Reza Taghavi, Hamid Taher Neshat-Doost, Hassan Hagh-Shenas and Dr Reza Kourmi Nouri and also to my wife and my children for their unwavering support and encouragement over the last four years.

Throughout the period of my study I have been funded by a grant from the Ministry of Culture and Higher Education of the Islamic Republic of Iran.

CHAPTER 1

GENERAL INTRODUCTION: BACKGROUND AND PROPOSED STUDIES

The intention behind the research reported in this thesis is to provide a clearer understanding of the cognitive characteristics, in particular attention, and memory for emotional material and performance in general memory tests in children and adolescents with Post-traumatic Stress Disorder (PTSD) and children and adolescents of adults with PTSD. The research methodology for the study of attention and memory involves the presentation of a set of information-processing paradigms, drawn from cognitive psychology, to groups suffering from PTSD, children of PTSD patients and normal control subjects. Most of the theoretical impetus behind this approach inevitably draws heavily on previous research which investigated information processing and memory deficits in adult subjects with anxiety disorders particularly PTSD. Consequently, Chapters Two, and Three present a wide ranging review of the theoretical frameworks which were developed in cognitive psychology and clinical psychology.

Chapter Two includes two parts: the first part begins by offering a brief historical view of the concept and definition of PTSD in terms of DSMIII-R, DSMIV, and ICD-10. PTSD is defined as an emotional reaction to events, disasters or accidents that are outside the range of usual human experience which can occur after natural disasters like flood, earthquake or war, rape, chronic illness, sexual abuse, kidnapping with three main characteristics: reexperiencing the traumatic event in thoughts, flashback and dreams; avoidance of any cues or reminders related to the trauma or situation; and hyperarousal such as disturbance of sleep, poor concentration, poor memory and hypervigilance. The classification of PTSD as a sub-group of anxiety disorder or dissociative disorder is discussed in some detail, and a short discussion of the symptomatology, and assessment of PTSD in adults and children is presented. The biological, and neuropsychological findings are also discussed in some detail and indicate that the psychophysiological measures of autonomic and somatic activities provide a useful approach in the diagnosis of PTSD and also provide insights into the emotional seqeulae of traumatic experiences. The results of neuropsychological studies also show that emotions associated with the PTSD symptomatic state are mediated by the limbic system including the hippocampus.

The second part of Chapter Two comprises a review of the literature related to children and adolescents with PTSD and this falls into several topics. The symptomatology of PTSD in children and adolescents is discussed with respect toYule's (1992) questions. Yule argued that the criteria of PTSD were not developed on the basis of studies of young people, so there are several essential questions such as "Do the same symptoms manifest?" A brief review of the child literature shows that, although young people with PTSD demonstrate most of the same symptoms as adults, there are some significant differences between the long term responses of children and adults (Terr, 1983) and there may be considerable comorbidity with depression, generalized anxiety, or pathological grief reactions (Yule, 1994). The developmental considerations are described where in the manifestation of PTSD symptoms depends on the developmental stage of the individual during the time of the trauma and are affected by factors such as age, sex, family functions, and the trauma events effect on the school performance of students with PTSD. Three non-cognitive theories are discussed in this chapter: Psychodynamic theory, Mowrer's (1968) two factor theory and the developmental model of Pynoos et al. (1995). According to Janet (1889) trauma results from a failure to take effective action against a potential threat. This view is similar to later cognitive psychodynamic theory. Following a trauma, dissociation of thoughts, actions and feelings from conscious awareness and voluntary control was the key process in Janet's theory. Freud (1920) emphasised two different factors in the development of what is now PTSD: (1) the quantitative aspects of the event, and (2) the 'preparedness' of the person involved in the traumatic event. Freud suggested that a traumatic event produces a breakthrough in the "stimulus barrier" and leads to to an overstimulation situation which the person confronts without any defence. Mowrer's two factor theory consists of two types of learning, classical and operant conditioning. Classical conditioning shapes a neutral stimulus via temporal contiguity which becomes associated with an unconditioned stimulus (original stimulus) that evokes a series of symptoms such as anxiety, fear etc. Then the neutral stimulus converts to a conditioned stimulus which elicits fear response when presented to the subject by two mechanisms generalization, and higher order conditioning. Pynoos et al.'s developmental model (1995) provides a comprehensive formulation for integrating various aspects of traumatic stress which are involved in the etiology, course, and outcome of PTSD in children and adolescents. This model pays attention to the traumatic experiences, the role of traumatic reminders, the nature, severity, and course of posttraumatic distress and its interactions with emerging personality, development, psychopathology, and the social ecology of the child.

Chapter Three describes two main functions of cognition (i.e. attention, and memory) and cognitive theories of emotional disorders particularly those related to PTSD. Attention is referred to as a selection of stimuli for future processing (Eysenck, 1991), and two forms are considered, focused-attention and divided attention. Theoretically, memory consists of three stages, encoding, storage and retrieval which interact in any kind of information processing, particularly in long term memory. Long term memory is split into two types, (a) declarative memory in which an individual has conscious access to memories that can be stated directly either verbally or by some other means. This includes semantic memory (general knowledge) and episodic memory (personal knowledge). Recall and recognition are two ways to assess declarative memory. (b) Non-declarative memory is knowledge to which the individual has no conscious access and can only be demonstrated indirectly through some form of action such as skills or priming.

The main aim of this thesis is to investigate attention and memory performance with respect to emotional material of children and adolescents with PTSD and children of adults with PTSD using various tasks. The Stroop colour-naming and attentional deployment tasks were used to study attentional bias,while recall and recognition tasks were used to study memory bias. The Rivermead Behavioural Memory Test was also used to study general memory in children and adolescents with PTSD.

Beck's (1979, 1985) schemata theory argues that anxiety-related experiences may lead to the formation of negative schemata related to danger in anxious people. Schemata are explained as cognitive structures for encoding, screening, and retrieving information. According to Beck the schemata are the source of cognitive biases in the processing of danger-related cues at all levels of the cognitive system. Bower's (1980) model suggests that all information in long-term memory (LTM) is stored in a network as nodes. Bower proposes that each emotional state is represented by a specific node in the network which acts as a focusing point for all associated aspects of that emotion and that information related to those aspects is more accessible when the subject is in the appropriate mood state. Bower concluded that the range and complexity of the network leave the anxious subject with an extensive and integrated set of connections centred on the anxiety node. Both of the aforementioned theories (Beck and Bower) suggest that anxious subjects will demonstrate systematic cognitive biases towards anxiety-related information across a wide range of cognitive paradigms. In contrast, Williams et al. (1988) propose that anxious individuals will show a bias in attentional tasks such as the Stroop and attentional deployment tasks which measure attention, while they show some kind of inhibition mechanism which prevents them from elaborating anxiety-related information in LTM and consequently they will not exhibit any processing biases on standard tests of memory such as recall and recognition. In line with these predictions, there has been a consistent failure to demonstrate biases in studies which have employed traditional recall and recognition memory tests with anxious subjects, nor in those which have used the Stroop colour-naming task with depressed individuals. Such a pattern of findings does not fit with the cognitive models of Beck and Bower which predict memory biases in recall and recognition tasks for anxious subjects. In contrast, Williams et al.'s model seems to fit the empirical data. One of the main aims of this thesis is to ascertain the profile of memory and attention effects in children and adolescents with PTSD.

Cognitive theories of PTSD which were mostly developed in the last decade are described in some detail. According to Horowitz (1979), traumatic events involve heavy amounts of internal and external information. Most of this information cannot be matched with an individual cognitive schema, therefore it leads to non-integrated information and information overload. Consequently this leads to symptoms of PTSD. Foa's fear network model of PTSD (1989) was developed on the base of Lang's analysis of fear structures (e.g. Lang, 1985) which is discussed in the same chapter. Foa maintains that the fear network consists of three types of information: information about the traumatic stimulus, information about cognitive, physiological and behavioural responses to the trauma, and information about interpretation of the stimulus. The fear network can be activated by triggering stimuli which cause information to enter consciousness in the network and this leads to PTSD symptoms such as intrusion. Brewin et al.'s (1996) and Creamer et al.'s (1992) cognitive models are described. Creamer et al.'s model is a combination of Horowitz's formulation and the network conceptualisation of Foa. They suggest five stage for the processing of trauma-related information: (a) objective exposure, (b) network formation, (c) intrusive thoughts, (d) avoidance and (e) outcome. Creamer et al. carried out a study with victims of an office block shooting in Australia to support their model. The SPAARS (Schematic, Propositional, Associative and Analogical Representational Systems; Dalgleish & Power, 1995) approach is a functional model which comprises four levels of representation of information: analogical, propositional, schematic models, and the associative level. The traumatic information is appraised at the schematic model level as a threat and fear is generated and it is encoded and represented at the analogical, propositional and schematic levels of meaning and these kind of representations of trauma-related information are incongruent with the individual's schematic model of self, the world and others and consequently this will cause various PTSD symptoms.

The traumatic experience presents information which is incompatible with the pre-existing models or representations. Unsuccessful processing occurs when the individual is unable to integrate the trauma-related material with the current information leading to cognitive dysfunction. The present study sought to examine elements of this hypothesis, namely, information processing, in children and adolescents with PTSD.The empirical research which bears on information processing in emotional disorders is reviewed in later chapters.

Cognitive problems are among the important and common sequelae in patients with PTSD, for example poor memory, poor concentration, intrusive thoughts and flashbacks (Yule, & Gold 1993; Last; 1993; Bouman & Scholing; 1992). In recent years, investigators have started to study these functions and some of the imagery paradigms like Stroop and memory paradigms have been used to assess psychophysiological reactivity associated with traumatic memories in combat-related PTSD, but have yet to be used to investigate PTSD in young people (McNally; 1991). Therefore, this literature is reviewed briefly in chapter three and the later chapters describe different experiments which were carried out on cognitive functions (attention and memory) with children with PTSD and children of adults with PTSD.

The development of a Dictionary of Emotional Words is described in Chapter Four. Many studies (see Mathews & MacLeod, 1994, for a review) have tried to study information processing in emotional disorders using various experimental paradigms such as memory, attention, and interpretation. In these paradigms, words with differring emotional content (for example, threat, sad, happy, and neutral) are used as stimuli. The frequency, length, emotionality, and self-relevance of the words are four factors which influence the subjects' responses to such tasks. To develop experimental tasks for adults, words with different emotional contents are chosen from available sources and used as stimuli. There are no published sources containing the frequency of usage of emotional words by children and adolescents. The purpose of this study was to develop a pool of emotional words collected from children and adolescents. Two hundred and twenty one child students from primary and secondary schools completed a questionnaire that included 10 questions in which children were asked to write down different types of word (i.e. threat, sad, neutral and happy words). Through analysis of these data, a suitable dictionary of emotional words was created.

Chapter Five presents the first experiment involving attention using a version of the Stroop paradigm. In this experiment, young people with PTSD, children of adults with

PTSD and normal subjects, participated in a colour naming task. The task consisted of five categories of words: threat-related, depressed-related, trauma-related, positive and neutral words which appeared on the screen of the computer in different colours. Increased relative mean latency to name the colours a particular word type are written in is thought to reflect a processing bias for these words. The literature using this task on adults with PTSD shows that PTSD patients generally took longer to say the colour of trauma-related words (Kaspi & McNally, 1991; Cassiday, McNally & Zeitlin, 1992; McNally, English, & Howard, 1993; 1992, 1993; Foa, 1991; Thrasher, Dalgleish & Yule, 1994). Also the results of the one study with grown-up children of adults with PTSD indicated that the children showed colour naming interference on the Stroop task (Motta et al., 1994). The present study sought to investigate such processing biases in children with PTSD as well as in children of adults with PTSD.

A second experiment relating to attention is described in Chapter Six. Patients with PTSD and normal subjects participated in the probe dot task. Four types of words: physical threat, social threat, sad and neutral words, were presented in pairs via computer to the subjects. Following the word pair, a dot sometimes appeared in the position of one the previously presented words. The subjects were asked to press a button when they saw the dot on the screen. Faster response to the dot is taken to indicate that subjects had been attending to the word which the dot replaced. Research with adult subjects with anxiety indicates relatively faster response times when the dot has replaced a threat word. Findings using this measure to assess attention in children with anxiety disorders have yielded a similar attentional bias (Vassey et al., 1994; 1995). The present study sought to examine attentional processing of emotional material in children with PTSD using this task.

Chapter Seven investigates memory bias in young people with PTSD and children of PTSD patients. In this experiment, subjects performed recall and recognition tasks. Five categories of words including: (a) threatening words, (b) depressed words,(c) PTSD words related to trauma,(d) happy words, and (e) categorised neutral word were used. According to Williams et al.'s (1988) model (see Chapter 3), memory bias is for emotional material related to strategic processing of information, and patients with anxiety who have problems in automatic processing of information but not strategic should not show a memory bias. Research with adults with PTSD (a subgroup of anxiety disorder) is equivocal with respect to memory for trauma-related material. The present study sought to investigate memory for such material in children affected by trauma.

The last experiment is discussed in Chapter Eight. Patients with PTSD and normal subjects participated in a neuropsychological memory assessment (Rivermead Behavioural Memory Test; Wilson et al., 1990).

The adult literature suggests that PTSD patients suffer from general memory deficits (Everly & Horton, 1989 Gil et.al., 1990; Bremner et. al., 1993; Bremner et al., 1995, and Yehuda et. al., 1995). The findings of a study with children with PTSD also showed that the traumatised group differed on the basis on neuropsychological functions including memory, attention, and higher cognitive functions from the control group (Palmer, 1995). The present study was a comprehensive examination of general memory performane in children affected by PTSD.

Finally, Chapter Nine is a concluding chapter which summarises the experimental findings reported in the earlier chapters and presents a discussion of their possible explanations in the context of previous research, particularly with respect to the cognitive models discussed in chapter three. The last part of this chapter discusses the implications of the work reported in this thesis for future research in the area.

CHAPTER 2

POST-TRAUMATIC STRESS DISORDER

2.1. Historical view of PTSD

In the last decades reaction to trauma has been described under various labels such as Compensation Neurosis (Rigler, 1879), Nervous Shock (Page, 1885), Traumaphobia (Rado, 1942), War Neurosis (Grinker and Spiegel, 1943), and Hysteria (Putnam, 1981). Later descriptions of PTSD were labelled according to the type of trauma, e.g., "rape trauma syndrome" (Burgess and Holstromm, 1974), "survivor syndrome (Kijak and Funlowicz, 1982), and "shell shock" (Myers, 1940).

The concept of posttraumatic stress disorder (PTSD) was developed in 1980 to describe the consequences of extreme experiences. The concept was strongly influenced first by psychoanalysis and more recently by cognitive behavioural psychology. This historical discussion will clarify the various ideas, issues and their development over the years leading to the develpoment of the classification of PTSD. An historical perspective of PTSD must consider three period stages as follow (Kleber & Brom, 1992):

1- Before World War I

2- World War II

3- Modern Developments

I will consider each period in turn. A formal appraisal of the psychophysiological effects of massive trauma arose in the Nineteenth Century (Cooper, 1986). In that time, attention initially turned to the psychological effects of combat (Trimble 1981). During the American Civil War, physicians observed states of physical and mental exhaustion, or neurasthenia, occurring in soldiers exposed to fighting. Some time later, Da Costa (cited by Kellett, 1982) used the term 'irritable heart' (which had previously been used by

McLean, 1867) in clinical descriptions. According to this view, irritable heart was a form of cardiac malady common among camp soldiers.

During World War I there were many cases of shell shock in addition to physical injuries. Many soldiers suffered from different types of symptoms like panic attacks, startle responses, sleep disturbances and repetitive battle dreams. Some authors attributed these symptoms to brain lesions (Mott, 1919), while some authors tried to explain the physical factors of this phenomena, some others attended to the importance of non-organic factors in an individual's reaction to the stress.

During World War II, Kardiner and Spiegel (1940) postulated that war stress was a psychological trigger for all the variously named conditions such as shell shock, battle neurosis and combat fatigue. Since then, many types of psychological stressor like fire, rape, kidnap, personal violence and so on have been examined.

In 1958, the first edition of the American Diagnostic and Statistical manual (DSM-I) did not recognise any syndrome of traumatic stress reaction but included this constellation problems as gross stress reaction, a transient response to severe physical or emotional stress. The DSM-II eliminated the diagnostic category of gross stress reaction. It was only in DSM-III (1980) that PTSD was recognised as a distinct clinical entity.

2.2. The concept of PTSD

Post-traumatic stress disorder is defined as an emotional reaction to events, disasters or accidents that are outside the range of usual human experience. PTSD can occur after natural disasters like floods, earthquakes or after war, rape, chronic illness, sexual abuse, and kidnapping.

PTSD has three main characteristics as follow: (a)the traumatic event (s) is reexperienced in thoughts, flashbacks and dreams; (b) avoidance of any cues or reminders related to the trauma and its situation; (c) hyperarousal such as disturbance of sleep, poor concentration, poor memory and hypervigilance.

2.3. PTSD criteria in DSM-IV and ICD-10

There are two major classifications of mental disorders: (a) Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) and (b) International Classification of Diseases (ICD-10).

2.31. PTSD in DSM-IV

In DSM-IV, PTSD is classified as an anxiety disorder, (APA,1994, p. 424):

"The essential feature of Posttraumatic Stress Disorder is the development of characteristic symptoms following exposure to an extreme traumatic stressor involving direct personal experience of an event that involves actual or threatened death or serious injury, or other threat to one's physical integrity; or witnessing an event that involves death, injury, or a threat to the physical integrity of another person; or learning about unexpected or violent death, serious harm, or threat of death or injury experienced by a family member or other close associate (Criterion A)."

Exposure to traumatic events without the formation of symptoms of PTSD occurs frequently. Therefore it should be noted that the presence of a traumatic history does not necessarily lead to PTSD symptoms (Blank, 1994). However, in cases of PTSD, the traumatic event will lead to the following symptoms:

Re-experiences symptoms (Criterion B): The subject reexperiences the traumatic event in the form of emotions, thoughts, behaviours, and physical reactions.These groups of symptoms consist of intrusive recollections (B1), distressing dreams such as nightmares (B2), acting or feeling as if the traumatic event were recurring with vivid images or flashbacks (B3). Yager and Gitlin (1995) state that:

"A flashback is an intense visual reexperience of highly charged past events, which are often replays of hallucinations.... In Post-Traumatic Stress Disorders some complex intrusive flashbacks like images may attain hallucinatory vividness. Images often include horrifying memories of traumatic events that force themselves repeatedly into conciousness until they are acknowledged and worked through (1995, pp. 656)".

Intense psychological distress at exposure to internal or external cues that symbolise an aspect of the traumatic event (B4), and physiologic reactivity on exposure to cues (B5).

Avoidance symptoms (Criterion C): Avoidance symptoms can also occur at different levels. The sub-criteria of the avoidance symptoms are: avoidance of reminders of the trauma which consist of avoiding thoughts, feelings, or conversations (C1), and activities, people, or places (C2), amnesia (C3), markedly diminished interest or participation in significant activities (C4), detachment or estrangment from others (C5), restricted range of affect (C6), and a sense of a foreshortend future (C7).

Increased arousal symptoms which consist of: difficulty falling or staying asleep (D1), irritability or outbursts of anger (D2), difficulty with concentration (D3), hypervigilance (D4), and an exaggerated startle response (D5).

DSM-IV notes that the duration of the disturbance including symptoms B, C, and D should be more than one month. If the symptoms last for less than three months, a dignosis of "acute PTSD" is given. Chronic PTSD is diagnosed if symptoms appear for three months or more. Delayed onset PTSD is diagnosed if the onset of PTSD appears at least 6 months after the traumatic event.

2.3.2. PTSD in ICD-10

ICD-10 (1992) states that PTSD "arises as a delayed and/or protracted response to a stressful event or situation (either short- or long-lasting) of an exceptionally threatening or catastrophic nature, which is likely to cause pervasive distress in almost anyone (e.g. natural or man-made disaster, combat, serious accident, witnessing the violent death of others, or being the victim of torture, terrorism, rape, or other crime) (pp: 147)."

Predisposing factors such as previous history and personality traits are neither sufficient nor necessary to explain PTSD. According to ICD-10, the symptoms include: occurrences of repeated remembering of the traumatic events via intrusive memories such as flashbacks and dreams when exposed to the traumatic event or circumstances associated with the stressor (Criteria B), to display avoidance symptoms such as numbness when exposed with the traumatic event (Criteria C), inability to recall some important aspects of the traumatic event, to exhibit an increased psychological sensitivity and arousal such as sleep difficulty, irritability, difficulty in concentration, startle response, and hypervigilance (Criteria D).

ICD-10 states that criteria B, C, and D must be met within 6 months of the event. Comparing DSM-IV and ICD-10, it seems that both emphasise very similar criteria and symptoms. ICD-10 places more stress emphasis on the reexperiencing phenomena and much less on the emotional numbing which has proved difficult to find in adults and young people. ICD-10 also has stated that PTSD must be diagnosed only when it arises within 6 months of the major trauma.

2.4. Phenomenology of PTSD

2.4.1. Duration

It seems that immediately following a trauma normal and pathological reactions to (PTSD) may appear similar, even in intensity. The course would be expected, however, to deviate with normal reactions dissipating and pathological reactions becoming chronic.

Foa and Rothbaum (1990a, 1990b) found that nearly all of the rape victims in their sample exhibited PTSD symptoms immediately following the assault, but less than half continued to meet PTSD criteria after three months. The results from victims of nonsexual criminal assault were similar to those found for the rape victims. McFarlane (1988) suggested that PTSD at four months is a relatively good predictor for chronicity of the disorder.

2.4.2. Classification of PTSD

Brett (1994) stated that although PTSD is classified as an anxiety disorder, there is a debate over whether PTSD is an anxiety or dissociative disorder. The advisory subcommittee on PTSD for DSM-IV suggested that PTSD be placed in a new classification of Stress Response which is subsumed within the anxiety disorders.

2.4.2.1. PTSD classified as an anxiety disorder

In the present classification, PTSD is cited as a an anxiety disorder. It should be noted that the requirements for meeting a diagnosis of PTSD have changed slightly between (DSM-III, 1980) and DSM-IV (1994). Furthermore, it has been argued whether or not PTSD is an anxiety or dissociative disorder (Brett et al., 1988). There is some emprical evidence for the classification of PTSD as an anxiety disorder or dissociative disorder.

Unlike other anxiety disorders PTSD occurs only in response to an external event (as a diagnostic criterion). Various studies have shown that PTSD has comorbidity with anxiety disorders (Davidson et al. 1991; Green et al. 1989). Brett (1993) explains that PTSD co-ocurs most frequently with other disorders such as anxiety, depression and substance abuse. Green et al. (1989) concluded that some forms of PTSD are characterised by anxiety which is caused by stress experiences. Depresssion may also be a secondary condition developing in response to the chronic stress disorder rather than developing directly in reaction to stressful events.

A few studies of family history show that there probably is a genetic relationship between PTSD and anxiety disorders (Davidson et al. 1985, 1989). Although the results of some studies demonstrated that there are some psychological symptoms or physiological responses in common between PTSD and anxiety disorders, there also some differences between them. The association between PTSD and anxiety disorders is not strong on the basis of comorbidity and family studies. According to DSM-IV and ICD-10 the etiology of PTSD is very clear, while the aetiology of anxiety disorders is unknown.

2.4.2.2. PTSD as a dissociative disorders

However, as noted above, there are some arguments about the classification of PTSD as an anxiety disorder. According to Brett (1994) "evidence for this is, first the intense controversy in DSM-III-R (American Psychiatric Association, 1987) over whether PTSD was an anxiety or dissociative disorder (Brett et al. 1988), and second, the unanimous vote of the DSM-IV Advisory Subcommittee on PTSD to classify PTSD in a new stress response category (pp. 191)." Regarding this point some brief discussion is warranted.

Studies on dissociative phenomena, indicate that PTSD patients are more hypnotisable than patients with other disordres (Stutman & Bliss, 1985; Spiegel et al., 1988). Particularly, compared with generalised anxiety disorders, hypnotisability was twice as high in PTSD. Spiegel (1988) concluded that anxiety dissociation increases with severity of the disorder. Lowenstein and Putnam (1988) suggests that dissociation is a common trait in PTSD and multiple personality disorder (MPD). There is a physical manifistation of dissociation in some PTSD patients in response to traumatic events (Van der Kolk et al., 1989). However, Brett (1994) reviewed the studies on the relationship of dissociation and PTSD and concluded that PTSD can be related to dissociation in several ways, (1) Both dissociative disorder and PTSD are reactions to severe stress, (2) both disorders demonstrate memory disruptions which are more severe than other anxiety disorders, (3) amnesia symptoms such as flashbacks are common between PTSD and dissociative disorder. It therefore seems that the overlap between symptoms of PTSD and dissociative disorders is greater or more basic than the overlap between PTSD and anxiety or even depressive disorders.

Discussions about the relationship between PTSD and anxiety disorders on the one hand and between dissociative disorder and PTSD on the other hand, lead some authors to propose another classification of reaction to traumatic events. For example Brett cited a new category which has been proposed by Horowitz (unpublished,1989) under the title of Stress Response Disorder. This classification includes: (a) Acute Stress Disorder, (b) Posttraumatic Stress Disorder, and (c) Pathological Grief and Adjustment Disorder.

In summary, the recognition of PTSD as a separate category of psychiatric disorder in adults has been very meaningful and productive. PTSD is similar in some aspects but different in others from other anxiety disorders, particularly in the reexperiencing of the traumatic incident (Yule, 1994).

2.4.3. Biological and Physiological Studies

The features of PTSD can be divided into two groups, tonic and phasic. Tonic refers to those features that appear all the time or most of the time as a group of types of mental functioning. While phasic features are manifest from time to time. Symptoms like nightmares, flashbacks, and intrusive recollections are phasic rather than tonic and the avoidance symptoms are tonic rather than phasic (Pitman, 1993). Arousal symptoms in PTSD are a mixture: for example, some of them like insomnia and hypervigilance are tonic and some others, like the exaggerated startle response, are phasic features.

Numerous research studies have been done on the biology of PTSD. Rainey et al. (1987) proposed that traumatic memories, nightmares, flashbacks, or somatic reactions could be activated by autonomic arousal. Pitman and colleagues (1995) have employed Lang's (1985) script-driven imagery technique to study psychophysiological aspects of PTSD. They carried out four independent studies of medication-free PTSD and non-PTSD subjects, matched with regard to age, educational level, and severity of traumatic experience. Heart rate, skin conductance (SC), and lateral frontalis electromyogram (EMG-frnt) were recorded during subjects' personal traumatic imagery. In all four studies, they found significantly higher physiological responses during personal traumatic imagery in the PTSD subjects (Pitman, Orr, Forgue, de Jong, & Claiborn, 1987; Pitman et al., 1990; Orr, Pitman, Lasko, & Herz, 1993; Shalev, Orr, & Pitman, in press).

High heart rate and high systolic and diastolic blood pressure have been reported in patients who suffer from PTSD (Davidson & Baum, 1986). Recently Gerardu et al. (1994) compared 32 Vietnam veterans with combat-related PTSD and 26 Vietnam-era veterans with no combat experience, on various biological features. They found that PTSD veterans had significantly higher heart rate, systolic blood pressure, and diastolic blood pressure. These findings support the position that individuals with PTSD do indeed demonstrate higher levels of cardiovascular arousal across settings. These results confirmed the previous findings by Pallmeyer (1986), Mally et al. (1983), Blanchard et al. (1991a, 1991b). In another study, McFall et al. (1990) exposed a group of Vietnam veterans with PTSD and without PTSD to combat and noncombat stress films and compared physiological responses. They found greater increase in plasma epinephrine, heart rate, and blood pressure.

Many of the biological reactions are mediated by the autonomic nervous system, particularly the reticular activating system of the brain stem, the hypothalamus, and the pituitary gland (Van der Kolk, 1988). Studies on startle response with PTSD patients have shown that PTSD subjects had significantly greater startle response amplitude than control subjects at intermediate intensities of acoustic stimuli (Butler et al., 1990). Sleep disturbances are important features of posttraumatic stress disorder (PTSD). Mellman et al. (1995) report on the phenomenology and physiological correlates of symptomatic sleep events in PTSD. Recurrent awakenings, threatening dreams, thrashing movements during sleep, and awakenings with startle or panic are all common features in PTSD.

In summary, the psychophysiological measures of autonomic and somatic activities provide a useful approach in the diagnosis of PTSD and also in providing insights in to the emotional sequelae of traumatic experiences. Such studies are a good base for the examination of similarities and differernces in the patterns of physiologic reactivity across the various types of trauma by means of common methodology. It seems that neuropsychological studies will be useful in achieving a better understanding of the nature of PTSD.

2..4.3.1. Neuropsychology of PTSD

There have been two approaches to the neuropsychological study of PTSD, one approach tries to apply a selection of neuropsychological tests to find particular deficits in PTSD patients. Most of these standard tests are related to memory, concentration, attention and so on, and will be discussed later in detail (Chapter 7). The other approach is related to specific hypotheses and uses particular experimental methods.

The theory of Multiple Memory Systems (Nadel & O'Keefe, 1974; Nadel, 1994; Schacter & Tulving, 1994) emphasised that there are two brain systems of memory. One dependent on the hippocampus and the other not. It is clear that different parts of the brain produce different types of memory: for example, the hippocampus and the prefrontal cortex are centeral to episodic context, whereas procedural systems involve the basal ganglia and cerebellum (Nadel & Jacobs, 1995). Here I expand briefly on work on the limbic system including the hippocampus and amygdala which play an important role in producing different types of memory.

The limbic system is involved in emotions and behaviour necessary for self-preservation and for survival of the species (MacLean, 1985) and in the storage and retrieval of memory. Two particular parts of the limbic system have been implicated in the processing of emotionally charged memories: the amygdala and the hippocampus.

The amygdala is responsible for the evaluation of the emotional meaning of incoming stimuli (LeDoux, 1986). Lesions of the amygdala interfere with a wide range of emotional memory processes, including inhibitory avoidance, fear-potentiated startle, and conditioned fear (Davis 1992; Hemestetter, 1992; Kesner, 1992; LeDoux, 1992).

The hippocampus is a cortical structure which is involved in a variety of cognitive functions. The hippocampus plays an important role in spatio-temporal processing (Nadel & Jacobs, 1995) and the categorisation and storage of incoming stimuli in memory (van der Kolk, 1995). This is at the core of the cognitive map model (O'Keefe & Nadel, 1978). According to this model, the hippocampus is responssible for estabilishing episodic memories, and the processing of spatiotemporal features of these memories, spatial (where) information and temporal (when) information. Nadel and Jacobs (in press) emphasised the neurochemical activity of the hippocampus in stress situations. Basically, the hippocampus has two kinds of neurons or cortisol receptors; mineralocorticoid (MRs) and glucocorticoid (GRs) receptors. In the resting condition, the level of cortisol is low while, in the stress condition, its level increases. In the rest condition, about 70% of the hippocampal MR and 10% of the GR receptors are occupied by corticosterone whereas during stress situations corticosterone occupied about 70% of MR and up to 90% of the GR receptors. When a memory is formed under stress, a basic component of normal memory formation, i.e. the hippocampus, is disabled, so memory without spatiotemporal content is created. Therefore another component of normal memory formation i.e. amygdala can be potentiated, leading to highly charged emotional memories. With respect to PTSD, Nadel and Jacobs postulate that when a traumatic event memory is retrieved, the retrieved information is deprived of spatiotemporal context. This formulation emphasised that memories of traumatic experiences are timeless, frameless as if they are free floating and could come to consciousness by internal or external triggers. When memories which are likely to have visual characteristics are triggered they have a very "live" and fresh quality and for the PTSD sufferer it is as if they happening in the here and now rather than belonging to a specific time and place in the past.

2.4.3.2. Laterality of cereberal hemispheres

There is a body of research which shows brain hemispheric specialisation, particularly in emotions. Lateralised brain lesion studies (Heilman et al., 1974) and studies with various methods of stimuli presentation such as tachistoscopic presentation, single nostril presentation of odours and dichotic listening tasks reveal greater sensitivity of the right hemisphere in emotional information processing (e.g. Bradley et al, 1991; McCaffery et al., 1993). To study the role of the limbic system in memories of traumatic experiences, Rauch et al. (in press) conducted a study with PTSD patients using positron emission tomography (PET). Eight PTSD patients responded to a script-driven imagery provocation pardigm, in which PET scanning was performed during induced recall of traumatic experiences. The results revealed a significanly high level of regional cerebral blood flow (rCBF) in right sided limbic, paralimbic and visual areas.

Hagh-Shenas, Goldstein and Yule (in press) carried out a study to test the following hypothesis. They proposed that if the right hemisphere is disproportionately engaged in the processing of emotional information in contrast to the left hemisphere, trauma-related information which is highly charged with emotion should activate the right hemisphere significantly greater than the left. They assumed that the trauma-related information is non-verbal and visual whereas the non-traumatic information is verbal, thus it would be reasonable to find higher levels of right hemisphere activation in the processing of traumatic information and greater left hemisphere activation in non-traumatic but negative information. Seven different tasks, including mental arithmetic, music, listening to eight trauma-related cue words (for PTSD patients) or personal negative experience cue words (for control subjects) and smelling four different odours including: smoke, of garlic and decayed food, of forest, and peppermint. EEG recordings were used to record the brain activations from frontal, temporal, and parieto-occipital regions from the left and right hemisphere. Ten PTSD (burn accident) patients matched on age, and sex, with 10 control subjects participated in this study. All subjects were right handed and were not normosmic (i.e., no identifiable olfactory deficit) according to their reports. The results indicated that the right hemisphere, temporal area is more activated than the left hemisphere in trauma related information in PTSD patients. This finding is consistent with Bremmner et al. (1995) who found decreased right hippocampus volume in patients with PTSD. In sum the results of neuropsychological studies using PET, MRI, and EEG show that emotions associated with the PTSD symptomatic state are mediated by the limbic system including the hippocampus in the right hemisphere. The study descrided in Chapter 8 sought to investigate neuropsychological issues by assessing general memory performance of patients with PTSD using a standard neuropsychological memory test.

2.5. PTSD IN CHILDREN AND ADOLESCENTS

2.5.1. PTSD symtomatology in children and adolescents

According to DSM-IV, PTSD can occur at any time of the life span, including childhood. Theoretically it has been suggested that PTSD symptoms may depend on the developmental stage of the individual at the time of the trauma (Schwarz & Perry, 1994).

PTSD in DSM-IV is classified as a subgroup of anxiety disorders. The main problem is that the criteria were not developed on the basis of studies of young people (Yule, 1992). So, there are several essential questions like: Do the same symptoms manifest? do they manifest differently at different age? do they cluster differently, and so on (Yule, 1992). The main body of research in PTSD has been with adults, particularly combat veterans. In contrast, there are far fewer studies of children and adolescents to answer the aforementioned questions in this field. In recent years, investigations of PTSD in children and adolescents speculate that there are some differences from adult PTSD (Terr, 1983; Yule & Williams, 1990; Yule, Udwin, & Murdoch, 1990; Yule & Udwin, 1991; Yule, 1992, 1993, 1994).

Yule et al.'s experiences of assessing and working with child and adolescent survivors lead them to describe the following reactions in young people with PTSD. Repetitive and intrusive thoughts, sleep disturbances and waking through the night, flashbacks, fears of the dark, bad dreams, nightmares, being irritable and angry, separation difficulties even among teenagers, difficulties in talking even with parents and peers. Children and adolescents report a number of cognitive changes such as difficulties in concentration, particularly in schoolwork, memory problems both in mastering new materials and remembering old skills. They also become alert to dangers. Yule and Gold (1993) following DSMIII-R and ICD-10 classified these symptoms into three main groups in children and adolescents, mainly in the 8 to 18 years range or junior to secondary age, as follows:

1- Reexperiencing the traumatic event.

2- Avoiding thinking about the experience. The most common symptoms of this kind are, not talking with parents, not talking with peers, foreshortened future and change of priorities, guilt.

3- Heightened anxiety and arousal that may appear as: concentration difficulties; sleep disturbance; separation difficulties; memory problems; heightened alertness to dangers.

These symptoms seem to have varing time course. According to Gordon and Wraith (1993), responses of children and adolescents to disasters are divided in three main stages:

A- Short-term responses (first week) including fear and insecurity emotional reactions, regressed and disorganized behaviour, heightened arousal, confusion and disorientation.

B- Medium-term effects (first week to one year) including general stress signs, relationship problems, mood disturbance, attitude changes, discharge behaviour, pseudoneurotic symptoms, loss of developmental pathway, and school and performance problems.

C- Long- term responses (second year and beyond): developmental deviations, school failure and poor performance, personality change, chronic peers problem, poor physical health, preoccupation with other traumas and identity changes.

Investigations of children and adolescents with PTSD indicate that children and adolescents experience more trauma-related fears than normal control children (Wolfe et al., 1989; Yule et al., 1990), especially with respect to fears of a recurrence of the trauma (Pynoos & Nader, 1988).

Yule (1994) noted that young people with PTSD demonstrate most of the same symptoms of adults and there may be considerable comorbidity with depression, generalised anxiety, or pathological grief reactions.

2.5.2. Epidemiology

According to DSM-III R there is no direct information about the epidemiology of PTSD (APA, 1987), but it is clear that severe trauma such as war, natural disasters, torture and life threatening combat will produce PTSD in a high percentage of individuals particularly in children and adolescents. Pynoos et al (1987) performed a study on the epidemiology of PTSD following a sniper attack on the playground of school. The data were derived from a PTSD index, which indicates an obvious dose-response relationship. Children who were under fire obtained significantly higher scores (twice) than those walking home and much higher than (four times) those who were not at school on the day of the accident. They report that about 80% of the exposed children demonstrated the immediate onset of a full range of PTSD symptoms regardless of age or sex, while the children who were not in direct danger rarely showed acute PTSD unless other situational factors were also present.

At 14 month follow-up, Nader et al. (1991) reported that 74% of the most severely exposed childen in the playground still demonstrated symptoms of PTSD, whereas more than 80% of the unexposed children did not show such symptoms. Similar findings were found by Pynoos et al. (1993) with Armenian earthquake survivors with whom the PTSD reaction index was also used.

Other studies also documented very high prevalence rates of PTSD following severe disasters (McFarlane, 1987; Yule et al., 1990). It is important to say that most of these studies documented a strong relationship between severity of the exposure to the stressor and symptoms of PTSD. The role of subjective factors in developing of PTSD are important. It has been argued that in both adults and children high levels of pathology are related to the belief that the survivors were going to die during the incident, as well as to the experience of seeing dead and mutilated bodies (Williams et al., 1993; Yule et al., 1992).

2.5.3. Developmental considerations

Theoretically, it has been argued that the manifestation of the PTSD symptoms depends on the developmental stage of the individual during or at the time of the trauma. In spite of some data indicating no relationship between symptomatology of PTSD and developmental factors such as age, others document evidence supporting the hypothesis that symptomatology is related to biopsychosocial developmental factors (Lyons, 1987). Also as noted above, although there are some similarities between adults and children in symptomatology, there are some significant differences between the long term responses of children and adults which have been described by Terr (1983): (a) children do not demonstrate "psychogenic amnesia" or "psychic numbing", (b) posttraumatic play and reenactment are frequently observed in children and it is important in personality development, (c) children frequently report dreams related to their experience, and (d) have a limited view of themselves and the future and a consequent inability to make plans for the future.

In order to look at the effects of developmental aspects on PTSD in young people, the current study sought to investigate the effects of age on the information processing in children and adolescents with PTSD and in children of adults with PTSD.

2.5.3.1. Neurodevelopmental Factors

A body of studies investigating neurodevelopmental aspects of PTSD has proposed that the developing brain forms in response to the intensity, pattern, and nature of sensory, perceptual, and affective experience during childhood and adolescence (Perry et al., 1990; Perry , 1994). Schwarz, and Perry (1994) state that:

"A child's brain is undergoing critical and sensitive periods of differentiation. During this time, stressor-activated neurotransmitters and hormones can play major roles in neurogenesis, migration, synaptogenesis, and neurochemical differentiation......its plasticity of the brain makes the developing brain more susceptible to formation of malignant memories that affect not only the stress response system, but also the emerging organizations of neural networks regulating other basic states and characteristics of the individual (pp. 313, 1994)".

The organization of developing systems in traumatized children includes experience of fear, threat, unpredictability, frustration, anger, helplessness, hunger, pain, startle response, behavioural impulsivity, altered cardiovascular regulation and sleep abnormalities (Perry, 1994). It is clear that such children will be at risk of developing traumatized brain characteristics when exposed to any psychosocial stressor in the future (Perry, 1994). There is also a correlation between severe childhood trauma and adult psychiatric problems, particulary PTSD (Davidson & Smith, 1990).

2.5.3.2. Premorbid History

It is documented that prior emotional developed conditions probably increase the child's vulnerability to the event and also that stressful events are likely to exacerbate preexisting symptoms (Gillis, 1991). A traumatized child's cognitive development will influence their interpretation of traumatic events, as well as reported symptoms (Keppel-Benson & Ollendick, 1993). Schwarz & Bruce (1994) suggested that malignant memories rooted in early developmental trauma are likely to manifest later as disorders of self, personality, ego functions, and cognitive functions such as attention or affect and arousal.

2.5.3.3. Sex

It is documented that gender differences influence the develpment of reactions to trauma. Investigations show that females are more vulnerable to the effects of disasters than males (Lonigan et al., 1991; Yule, 1992a; Pynoos et al., 1993). Yule found that girls scored higher than boys on anxiety, depression, and fears as well as on the Impact of Event Scale (Horowitz et al., 1979). Burke et al. (1986) reported that young boys (6 years old) were more affected than girls, but 10 year old girls were more affected than boys. In the present set of studies, gender effect were examined across all four cognitive tasks to see whether the cognitive functions of young people with PTSD or children of adults with PTSD are affected by gender.

2.5.3.4. Family Factors

Children's PTSD has been reported to be associated with parental PTSD symptoms and family factors (Green et al., 1991). Moreover, Kelly (1990) points out that a traumatic event which leads to PTSD in children can also cause traumatic responses in family members. Child and adolescent survivors find difficulty in confiding their inner feelings to their parents, in part to protect the parents from getting upset (Yule, 1991; Yule & Williams, 1990). However, according to Schwarz and Perry (1994), a family which includes a symptomatic child-parent model may lead to the members synergistically triggering each other and expand arousal, re-experiencing, and avoidance symptoms in vicious cycles. The characteristics of such a system depends on individual, pre-event and post-event factors. One of the main aims behind the current thesis is to investigate whether the cognitive functions (namely attention and memory) of children and adolescents of parents who were involved in a severe traumatic event (while their children were not) are affected by the parents' trauma.

2.5.3.5. School factors

As already noted, school age children often display poor concentration and difficulites in learning, and this dullness and functional impariment of mental activities causes decline in school performance. School age children may report guilt, hypervigilance, change in play, change or loss their intersts, return to the old or onset new fears, sleep disorder, and impaired concentration, functioning (Schwarz, & Perry, 1994). Tsui (1990) documented that academic performance was affected by adolescents' traumatic experiences. His findings indicate that while, girls' who survived the sinking of the Jupiter cruise ship were above average in terms of academic accomplishments before the accident, they had significantly dropped below the average one year after the accident.

As a summary, the results of the empirical and clinical studies have shown that most of the developmental aspects such as brain development, emotional conditions, family structure, and ac ademic performance are affected by the traumatic event which leads to PTSD.

2.5.4. Assessment of PTSD in children and adolescents

There are now a number of sources from which information can be obtained for the assessment of post-traumatic reactions in children and adolescents (Finch & Daugherty, 1993). The most important measures which are frequently used to assess PTSD in young people are as follow:

2.5.4.1. Self-Report Measures

2.5.4.1.1. Impact of Event Scale (IES)

This measure was among the first PTSD assessment instruments and derives from Horowitz' formulation of PTSD (Horowitz et al.1979; Zilberg et al. 1982) which focused on avoidance and intrusive thoughts. The IES asks the patient to describe a target event and then rate the frequency with which 15 symptoms have occurred within the last week. Horowitz et al. (1979) reported good internal consistency of the subscales, (coefficient alpha = 0.78 for intrusion and 0.82 for avoidance). A correlation of 0.42 ($p < 0.0002$) between the intrusion and avoidance subscale scores was reported which indicates that the two subscales are associated, but do not measure identical dimensions. A good test-retest reliability was also found (0.87 for the total stress scores, 0.89 for the intrusion subscale, and 0.79 for the avoidance subscale).

The IES was developed for use with adult patients, and not with children and adolescents until Yule's studies of child survivors of shipping disasters (e.g. Yule & Williams, 1990; Yule & Udwin, 1990) which found the questions meaningful and reported scores as high as those of traumatised adults. In the current studies the IES was used to assess PTSD symptoms (namely intrusion and avoidance) in children and adolescents with PTSD.

2.5.4.2. Structured Interviews

2.5.4.2.1. The Children's PTSD Reaction Index (McNally, 1991)

The children's PTSD Reaction Index is probably the most widly used structured interview for assessment of PTSD in children and adolescents (McNally, 1991) and it shows good internal consistency and relates well to clinical judgement of the severity of PTSD (Yule et. al., 1992; Yule, 1994). This measure, first developed by Frederick and Pynoos (1988), has had several versions and has been used in a number of studies with childern and adolescents aged 5-17. The Children's PTSD Reaction Index consists of 20 items which can be used via interview or self-report.

2.5.4.2.2. Children's PTSD Inventory (Saigh, 1989)

The Children's PTSD Inventory was developed on the basis of the DSM-III (APA, 1980) criteria for formulating a PTSD diagnosis. The instrument presents four subtests that are scored on a dichotomous basis (i.e. 1 for presence and 0 for absence of symptoms). The first subtest assesses traumatisation through experimental, vicarious, or verbal mediation (e.g. "Have you had a very bad experience?", Did you see someone else having a very bad experience?" "Have you heard about someone else who had a very bad experience?"). The first subtest also makes provisions for the verbatim description of the experiences as reported by the examinee. The second subtest assesses unwanted anxiety-evoking recollections of the trauma (e.g. "Are you having a lot of unwanted thoughts about this?") and the third subtest assesses general affect (E.g. "Has it become difficult for you to feel things or show other people how you feel?"). Finally, the fourth subtest assesses divergent symptoms which were not apparent before the trauma (e.g. "Do you avoid people and places that remind you of what happened?").

2.5.4.2.3. Clinician-Administered Post-Traumatic Stress disorder Scale (CAPS)

The CAPS consists of 17 questions which permits one to assess all of the DSMIII-R symptoms of PTSD in both present and life-time incidence, intensity and frequency. The CAPS covers all three dimensions of PTSD including, re-experiencing, avoidance /numbing and hyperarousal, and can be administered repeatedly. It also assesses symptoms which are associated with PTSD such as depression, anxiety, homicidiality, guilt. The CAPS has been recently validated with Vietnam combat veterans and preliminary results confirmed the validity and reliability of the instrument (Keane et al. 1992).

There are also various semi-structured interviews to assess PTSD in young people according to DSM criteria. All of these measures are useful to explore the traumatized children's symptoms. However, Yule (1994) argued that "given that the phenomenology of PTSD in children is not yet fully established empirically, they can be only a guide to assessment and diagnosis. They are useful as screening devices, but are no substitute for a careful, individual, but expensive clinical interview. (pp, 233) ".

2.6. Theories of PTSD

An increasing variety of theories has been developed to describe the aetiology and symptomatology of PTSD. Early psychodynamic formulations emphasised the concept of "energy overload" in which the individual's emotions become overpowered. Behavioural models used to explain PTSD are generally based on two factor learning theory (Mowrer, 1960). More recently, a developmental model has been proposed by Pynoos et al. (1995) to conceptualise PTSD in children and adolescents. A variety of cognitive models have also emerged (Horowitz, 1979; Rachman, 1980; Foa et al., 1989; Creamer et al., 1992; Dalgleish & Power, 1995). Two theories which are non-cognitive will be discussed in the current chapter, while the cognitive models are discussed more fully in the next chapter.

2.6.1. Psychodynamic theory

2.6.1.1. Janet's view

The first systematic theory about the connection between traumatic events and psychopathology was developed by Janet (1889). According to Janet, trauma results from a failure to take effective action against a potential threat. This view is similar to current cognitive psychodynamic theory. Dissociation of thoughts, actions and feelings from conscious awareness and voluntary control was the key concept in Janet's formulation (Janet, 1889). For example, a person who responds to a severe event with strong emotions, such as intense anxiety and anger may fail to control these intense emotions, and may react by dissociating. The individual may also not be able to integrate the memories of the event into the memory system. Subsequently, this dissociation may subconsciously affect behaviour and result in various disturbances, such as amnesia, narrowing of consciousness, obsessional preoccupations and somatic symptoms. There are clearly some similarities between Janet's view and modern psychodynamic theory regarding the interpretation of posttraumatic phenomena such as the tendency to deny or avoid thoughts and feelings about the traumatic event (Kleber & Brom, 1992). psychodynamic theory deals with the relation between repressed material, integral personality functions and defense mechanisms, Janet, as noted, emphasised the dissociation of memories of traumatic events from conscious awareness. Although Janet's ideas have been forgotten for a long period of time, recently there has been a revival of interest in the issues he was dealing with, such as dissociation, hypnosis, and the storage of the traumatic experience in memory (Van der Kolk et al., 1989; Van der Hart & Freedman, 1989).

2.6.1.2. Freud's theory

In Freud's view trauma was basically defined as any experience which causes distressing affect, such as fright, anxiety, physical pain, and so on. Freud emphasised two different factors which are important in developing what would now be called PTSD: (1) the quantitative aspect of the external event (the severity of the stressor), and (2) the 'preparedness' of the person involved in a traumatic event in terms of the personal meaning of the event. There is a relationship between the concept of the traumatic event and the idea of "stimulus barrier" in psychoanalysis theory (Freud, 1920). A traumatic event produces a breakthrough in the "stimulus barrier" and leads to to an overstimulation situation which the individual confronts without any defence. According to Freud there is also a conflict between the ego and id when the traumatic event happens which is repressed into the unconscious. These circumstances lead the individual who experienced a severe event towards a posttraumatic reaction.

Freud's theory had a great influence upon later theories of PTSD such as Horowitz' formulation which link the psychodynamic model with information processing and developmental approaches. Pynoos et al. (1995) were also influenced by Freud's theory in developing their twofold developmental model of childhood traumatic stress (see below, section 2.5.3).

2.6.2. Mowrer's two Factor Theory

Mowrer (1960) suggested a two factor theory of avoidance behaviour. This model had a considerable influence on psychopathological and treatment models of anxiety disorders. For example, this model has been applied with some success to phobic and obsessive compulsive behaviour. The theory consists of two basic components: (1) anxiety is learned by classical conditioning in which a neutral stimulus comes to signal an aversive or traumatic event. (2) The conditioned anxiety provokes escape and avoidance behaviour. Avoidance behaviour is subsequently reinforced by the reduction of the anxiety drive.

In the case of PTSD, the application of the two process theory would mean that in the first stage, when the individual is exposed to a trauma (unconditioned stimulus) s/he acquires the ability to be upset by any situation which occurs in proximity to the trauma (conditioned stimulus). Due to instrumental learning (second factor) avoidance and escape behaviour from both the conditioned and unconditioned stimuli occur to decrease the level of anxiety. By higher order conditioning, a wide range of stimuli elicit arousal (stimulus generalisation).

Recently psychologists have tried to adopt Mowrer's theory to address characteristics of people who have experienced a severe traumatic event (Keane, Zimmerling, & Caddell, 1985; Becker, Skinner, Abel, Axelord, & Cichon, 1984; Kilpatrick, Veronen, and Best,1985). For example Keane, et. al. (1985) proposed that the individual who experienced a severe trauma (such as combat trauma) may become conditioned to a wide range of stimuli that are related to the trauma. These neutral stimuli (e.g. sound, time of day) then become associated with the original stimulus or trauma event through the process of classical conditioning, and therefore evoke the fear and anxiety. This phenomenon, due to processes of stimulus generalisation and higher order conditioning, then extends to a wide variety of situations which can elicit fear and anxiety responses in traumatised people. Thus, sudden loud noises such as a car backfiring, may elicit the PTSD responses i.e. re-experiencing, hyperarousal (in the classical conditioning stage) and avoidance behaviours (in the operant conditioning stage).

There are some critical points regarding to this theory which are as follows:

1- Although Mowrer's theory has been used to explain the symptomatology of PTSD with a variety of traumatised individuals, it seems unable to account for all aspects of the disorder. The startle response, which is characterised as a result of increased arousal in PTSD but is not present in other anxiety disorders such as agoraphobia and phobia, is not explained well by learning theory (Foa et al., 1989).

2- It has been argued that learning theory does not adequately account for nightmares (Foa et al., 1989) although it may plausibly explain intrusive thoughts or flashbacks.

3- Finally, Peterson et al. (1991) noted that the potential problem with learning theories is that they do not pay enough attention to higher order structures such as attributions, motivation, no~~t~~r to developmental aspects, and interventions.

2.6.3. The Twofold Developmental Model of Childhood Traumatic Stress

Children who suffer from PTSD are affected by developmental factors. Their experiences, symptomatic presentation, emotion, course of recovery and behaviour are all affected by developmental processes (Pynoos & Nader, 1993). Developmental aspects also influence the cognitive functions of traumatised children such as appraisals, perception, interpretation and coping . An important question in this area concerns the aetiology of these effects, whether objective (external) factors are more important than subjective (internal) factors. Discussion of this point led Pynoos et al. (1995) to present a developmental model of responses in traumatised children and young people.

Pynoos and his colleagues (Pynoos & Nader, 1993; Pynoss, Steinberg, & Wraith, 1995) were inspired by Freud's work (1926) on traumatic helplessness which emphasised the external and internal danger in development of the traumatic reaction. Pynoos et al. stated that:

"In traumatic situations, the experience of external threat involves an estimation of the extreme magnitude of the threat, the unavailability or ineffectualness of contemplated or actual protective actions by self or others, and the experience of physical helplessness at irreversible traumatic moments. The experience of internal threat includes a sense of inability to tolerate the affective responses and physiological reactions, as well as a sense of catastrophic personal consequence. The latter includes both dire external and psychodynamic consequences (Pynoos et al., 1995, p. 76)."

The extent of the external and internal threat proposed by Pynoos et al. depend on the differences in level of exposure, development, maturity, prexisting experiences and subjective appraisals of the child. The internal responses of the traumatised child encompass the autonomic or affective reactions and the emerging attribution of symbolic meaning and psychosexual interpretation. As children grow up, their cognitive abilities change. They rely less on external cues (such as the caretaker) in their appraisal of life threat, and more on internal cues and understanding of the potential threat. Adolescents may rely on their appraisals and images of threat, even when it is not carried out. Internally, children are confronted with a variety of threats such as physical and affective responses, sense of helplessness, self-concept disturbance, loss of love, super ego condemnation, processes of identification. According to this model, the children demonstrate a developmental hierarchy of responses to the external danger in their conscious fantasies which, coincidentally, assimilate changes in how they address internal danger.

2.6.3.1. Traumatic reminders

Based on clinical experiences with children, Pynoos et al. explained that the types of common traumatic reminders include the event-specific circumstances, precipitating conditions, characteristics of an assailant, signs of danger; endangering objects, associated affective exchanges, indicators of distress, unwanted results and signs of injury or death, and parent or teacher reactions during or at reunion. Internal reactions of the children include, kinesthetic, sensory, and bodily sensations, a sense of helplessness, fear, ineffectualness, and feelings of aloneness, shame, guilt, anger, and sadness.

According to Pynoos et al. different aspects of traumatic reminders such as nature, context, frequency, and impact may vary with development and experience, and particularly with the capacity for appropriate cognitive discrimination. Development influences the degree to which a traumatic reminder exacerbates reactions to nontraumatic stress, reactivates or intensifies earlier traumatic distress, or recruits issues of risk and protection from an earlier developmental schema. However, the child may be challenged by two or more sets of reminders, to both current and past experiences (Pynoos et al., 1991).

Traumatic events are commonly associated with four main factors which act as secondary stresses: family function, social structure and values, community and school organization, and individual challenges to the child. Family functioning may be affectd by events such as parental loss, separation of child from the family and so on. A major source of secondary stress for children is postrauma disturbance in the family. As Pynoos et al. state: "These are often due to parent's own traumatic reactions or grief-related preoccupations, exacerbation of their preexisting psychopathology, and demands on them from secondary adversities (pp. 81, 1995)."

It seems that children and adolescents often describe their own experiences in detail, because they do not show amnesia symptoms which we can see in adults with PTSD. Sometimes children try to omit some parts of the experience from conscious memory or reorganise an experience in order to reduce internal or external threat. Another point about the memory of traumatised children is that specific trauma-related imaginary actions are assimilated into the memory representations of the event (Pynoos & Nader, 1989). Children suffering from PTSD try to contend with a loss or traumatic injuries by employing mechanisims such as fantasy or denial to react against internal or external danger. The fantasies about traumatic events involve conscious and unconscious attempts to find ways of acting out and reducing the anxiety. Retaliation fantasies is one important source of understanding how children address their traumatic helplessness after the event.

2.6.3.2. Proximal stress-related psychopathology

The ability of children to tolerate and respond to acute events is variable. The outcome may also vary from a relatively successful adaptation that includes restored psychological, interpersonal, and academic performance to severe trauma-related pathology and developmental disturbance.

The reactions to trauma may appear in different recognizable patterns of psychiatric disorder.

"Children and adolescents' posttrauma psychopathology have been reported to include PTSD, phobic and overanxious disorders, trauma-related disorders of attachment and conduct, new onset attention deficit disorder, depression, substance abuse, and dissociative, sleep, and somatization disorders. (p. 81, 1995)"

The most frequent diagnoses which correlate with degree of exposure are PTSD, depression, attention deficit, and phobic disorder. Depression also is correlated with the frequency and intensity of grief reactions (Pynoos & Nader, 1992).

In summary the developmental model provides a comprehensive formulation for integrating various aspects of traumatic stress which are involved in the aetiology, course, and outcome of PTSD in children and adolescents. This model pays attention to the traumatic experiences; the role of traumatic reminders; the nature, severity, and course of posttraumatic distress and its interactions with emerging personality, development, psychopathology, and the social ecology of the child.

Pynoos et al.'s model explains the effect of the traumatic event on children and adolescents takes into account of the developmental considerations. Pynoos et al.'s formulation also pays attention to differences in outcome following the traumatic event between young people and adults. So it should be applicable to the current study which involves young people who suffer directly from PTSD or children of adults with PTSD.

2.7. Summary and conclusion

At the begining of this chapter in a historical and conceptual perspective of PTSD was considered. PTSD is defined as an emotional reaction to events, disasters or accidents that are outside the range of usual human experience. PTSD has three main characteristics: reexperiencing, avoidance and hypervigilance. Some of the arguments on the classification of PTSD as a sub-group of anxiety disorders or dissociative disorders and a short discussion of the symptomatology, biological and neuropsychological findings and assessment of PTSD in adults and children was presented. A review of the literature related to children and adolescents with PTSD including the symptomatology of PTSD in children and adolescents, differences between long term responses of children and adults, comorbidity with depression, generalized anxiety, and pathological grief reactions were presented. The developmental considerations were described where the manifestation of PTSD symptoms depends on the developmental stage of the individual during the time of the trauma and is affected by factors such as age, sex, family functions, and the traumatic event's effect on the school performance of students with PTSD. Three non-cognitive theories including: the psychodynamic (Janet and Freud), Mowrer's (1968) two factor theory and the developmental model of Pynoos et al. (1995) were described. In the experimental chapters of this thesis the cognitive functions of young people suffering from PTSD and children of parents with PTSD and studied with respect to developmental considerations such as age, sex, and the effect of the parents' trauma.

CHAPTER 3

COGNITION AND EMOTION

3.1. Introduction

At the beginning of the last decade there was a serious debate revolving around two different views about the relationship between cognition and emotion. For example, Zajonc (1980) proposed that emotion can be completely independent of cognition. According to this view, some emotional reactions, such as fear, can be evoked by, for example, accidentally stepping on a snake, and they seem to happen very fast. In fact, the suggestion is that the emotional reaction of fear is likely to be completed before cognitive analysis of the stimulus has ended. The alternative view suggests that cognitive analysis is not only necessary for the production of emotions, but it is the main factor in their production (Lazarus, 1982). This view also emphasises that the emotional reaction will be rapid due to automatic processing of the stimulus which is involuntary, non-conscious, and fast in nature, yet still cognitive.

Although some disagreement abut the direction of the relationship between cognition and emotion still remains, the view that cognition is closely related to the emotion is now generally agreed (Izard, 1993). Most current debates revolve around types of processing. Cognitive psychology suggests a distinction between strategic and automatic processing. Automatic processing is relatively independent from consciousness, while strategic processing depends on awareness and consciousness (Mathews & MacLeod, 1994). Cognitive theories such as the network model (e.g. Bower, 1992) assume that some of the critical processes involved in emotion are automatic (e.g. spreading activation), and different emotions probably vary in the level of automatic processing involved (Mathews & McLeod, 1994). Any understanding of the relation between cognition and emotion needs to consider the interface between automatic and strategic processes. Although it seems that many of the cognitive factors involved in emotion are automatic, intentional strategic processing can sometimes modify such automatic operations (Mathews, 1993; Mathews, & MacLeod, 1994). This thesis concentrates on two main cognitive functions i.e. attention and memory in PTSD which both contain consider elements of automatic and strategic processing. This chapter reviews the theoretical issues regarding these processes and also reviews theoretical frameworks which address the relationship between cognition and emotional disorders, particularly PTSD.

3.2. Attention

Everyone is continually confronted with a wide range of choices, and must decide to which subset of the massive influx of discriminable stimuli to attend, or what way to process the selected display. Attention and higher processing are complementary domains of cognition. Although attention sometimes can refer to concentration, it is generally used to refer to selectivity of processing (Eysenck, 1991). Regarding definition most authors (Eysenk, 1991; Dalgleish, 1994) refer to William James' description of attention. James states that attention is:

" ...the taking possession by the mind, in clear and vivid form, of one out of what seem several simultaneously possible objects or trains of thought" (James, 1890/1952, p. 261)."

David Marr (1982) has described three levels of analysis of cognitive processing: (a) computational level which is the most abstract and is a description of what the system as a whole is doing; (b) the representational level which is a specification of how the task is carried out; (c) the hardware level which is the machinery within which the representational level operates. In the case of humans the last level is the central nervous system. For example, Dalgleish (1994) has applied this framework to attention and has suggested that within the computational level, the processing of attention occurs in two different domains, automatic and controlled or preattentive and attentive. The characteristics of these two domains are summarised by Dalgleish (1994) as follows:

"Within a computational framework attention can be conceptualized as the process by which a small subset of all the possible information represented in one processing domain, Domain A, is selected for processing in a qualitatively different processing domain, Domain B. Domain A is characterized by processing which is rapid, unavailable to conscious stimuli, ineffectual with respect to the capacity to perform other tasks, and finally, modular. In contrast, Domain B processing is conceived of as slow, of limited capacity, flexible, and available to consciousness" (Dalgleish, 1994 P. 157).

According to Kinsbourne (1994) some selections are prenatally preprogrammed in the nervous system, (e.g. startle response to an unexpected terrible stimulus at the first exposure), while others although slowly and learnd with difficu lty become essentially automatic (e.g. as in the Stroop test, where the subject reads the word, even when s/he knows that it is an irrelevant distractor). Attention develops as a systematic increase in the child's ability to extend inborn response tendencies, when it is adaptively profitable to replace them with alternative responses in a particular situation. One can consider two types of attention: focused-attention and divided-attention.

In a focused-attention task, the subject is instructed to concentrate on one of several stimuli in the environment and ignore others, and the experimenter can assess the ability of the subject to focus attention on the target stimuli and resist interference. For example, in a dichotic listening task, two rows of words are presented coincidentally, at a fast rate through the headphones to the two ears, and the subject is asked to listen and respond only to the message presented to one ear and to ignore the other.

In a divided attention task, the subject is instructed to divide attention among concurrent stimuli. In a typical design, the subject is required to divide attention between two rows of words presented dichotically, or to perform a manual tracking task together with a classification task both presented visually on the computer screen (Eysenck, 1991, 1994).

The Stroop and attentional probe dot tasks (see Chapters 5 and 6 respectively) are two ways to measure attention. Both biases are valid (e.g. Eysenck, 1992) as measures of involuntary attention or distractibility in which the subject's performance is indirectly affected in the stimulus content. In the case of PTSD, it seems that the experience of a traumatic event might produce heightened distractibility in tasks unrelated to the traumatic situation. The disruption would probably be greater if the distracting stimuli were related to the traumatic event or were a reminder of the traumatic situation. Therefore, PTSD patients should show an attentional bias, in which traumatic stimuli are preferentially processed (i.e. more likely to distract the subject) in situations in which trauma-related and neutral stimuli are presented concurrently.

As noted, the Modified Stroop task is commonly used as an experimental paradigm which involves distraction (see Chapter 5). Stroop (1935) found that the speed of naming the colours in which words were printed was greatly slowed when the words were themselves colour names differing from their ink colour (e.g. the word "RED" printed in green). This paradigm has been modified at the begining of the last decade to study the effect of threatening stimuli in cognitive processing of emotional disorders. In the adult PTSD literature, the general finding is that PTSD patients are slower to colour-name trauma-related words relative to normal subjects, the argument being that these words are more distracting.

In the case of the attentional probe dot task, a threatening and non-threatening stimulus are presented concurrently, and the allocation of processing resources to the two stimuli is assessed by examining reaction times to a neutral probe which immediately follows the two words on the screen. Anxious patients generally show a selective attentional bias favouring threat-related stimuli. For example, Macleod et al. (1986) presented negative and neutral words pairs on a computer screen and asked subjects to detect the occurrence of small dot probes that could appear in the location of either stimulus word following termination of the display. Anxious patients were relatively faster to detect probes which replaced threat words. Two experiments using the modified Stroop and dot probe tasks with children with PTSD are described in Chapters 5 and 6 respectively. The detailed literature concerning those paradigms is reviewed in detail in the relevant chapters.

3.3. Memory

3.3.1. Stages of Memory

Any system of memory for storing information needs to be able to encode the information, to store the information, and finally to retrieve the same information. These three stages are linked to each other, and it is difficult to establish any phenomenon as entirely happening at a single stage; however, this classification of processing stages seems to be useful in understanding memory systems.

3.3.1.1. Encoding

Encoding is the first stage of processing information, and involves learning and memorising. Immediate memory generally relies on encoding in terms of the phonological or sound characteristics of the material. For example similar items in sound (e.g. *mad, map)* are much less likely to be recalled correctly than dissimilar ones (e.g. *pit, day),* because the system encodes the material in terms of sounds. There is no such effect with similarity of meaning (e.g. *large, big)* (Baddeley, 1966). Different types of encoding can be produced by instruction, manipulation, or combination of these two parameters in experimental situations. Variation of encoding operations leads to differences in recall or recognition.

3.3.1.2. Storage

Forgetting is defined as a refelection of the loss of information or of lowered memory performance following learning over time (Parkin, 1994; Baddeley, 1995). It can occur due to decay of the information stored in memory over time, or by displacement when the demands on that store exceed its capacity. Interference theory postulates that forgetting results from contamination by other information stored either during prior learning (proactive interference) or later learning (retroactive interference). Disruption of memory will increase with greater amounts of prior or subsequent interfering material, and also with greater similarity between the interfering and the learned material (Baddeley, 1990).

3.3.1.3. Retrieval

It focused attention and retrieval are conceived as serial processes which are both rate-limited and capacity-limited. Regarding long-trem memory, retrieval acts as a memory modifier such that retrieved information from long term memory is placed in working memory where it can be further processed and placed again in storage (Siegel, 1993). Retrieval acts in direct (i.e.recall, cued recall and recognition tasks) and indirect (i.e. priming effects, word stem completion) forms. The encoding specificity principle (Tulving & Thomson, 1973) emphasises that reproduction (retrieval) is successful only if a cue directly matches the original stored information.

3.3.2. Classification of memory

3.3.2.1. Declarative Memory

Declarative memory (Cohen & Squire, 1980; Cohen,1984) refers to the conscious recollection of facts and events that are usually called "memory" and "remembering" in ordinary language. "Fact-and-event memory" refer to memory for words, scenes, faces, and stories which can be assessed by ordinary tests of recall and recognition. Other similar terms include "explicit memory" (Schacter, 1987, 1992, 1994), "configural memory" (Rudy & Sutherland, 1992, 1994), and "relation memory" (Eichenbaum, 1992).

Declarative memory comprise the two subsystems originally defined by Tulving (1972) as "episodic" or "events" and "semantic" or "facts" memory. Episodic or event memory refers to the system involved in the recollection of personal experiences and events or episodes from the past, for example, remembering what you had for lunch, or what date you were born. Semantic memory refers to knowledge of the world; for example, knowing the name of the Iranian capital, or knowing the name of the present president of the USA.

3.3.2.1.1. Episodic Memory

The episodic memory system is supposed to be the most recently evolved system that has grown out of semantic memory through working memory (Tulving, 1991). It consists of different kinds of information such as spatial, temporal, and contextual bounding together with the individual's awareness of personal experiences and is sensitive to depth of processing (Tulving, 1991, 1993). Episodic memory is strongly affected by degree of attention and organisation, which is important for setting up memory structures that are accessible to retrieval. Baddeley (1994) proposed that the episodic learning mechanism is capable of rapidly forming links between stimuli experienced at the same time such that one experience evokes another one. In general a conscious recollection of a previous event or a study episode is an essential feature of episodic memory.

3.3.2.1.2. Semantic Memory

Semantic memory produces the acquisition and retention of factual information about the world in the widest sense. The knowledge and beliefs about the world that people reach, possess, and use in both general or specific, concrete or abstract forms are critically related to semantic memory.

Semantic memory is proposed as a source of the material needed for thought and recollection, and it goes beyond what can be immediately perceived (Nilsson, 1993). However, the utilisation of information in semantic memory does not require a conscious recollection of the situation in which the information was acquired. The neuropsychological location of episodic and semantic memory is not clear, but it seems that the prefrontal-cortical areas are involved in episodic memory, while the medial-temporal-lobe regions are implicated in the semantic memory system (Schacter & Tulving, 1994).

3.3.2.1.3. Recall and Recognition

It has been suggested that recall and recognition are normally two different ways of measuring declarative memory. In one way, recall and recognition are related to each other functionally, thus studies with amnesic patients indicate similar impairments. On the other hand, studies with normal subjects show that recognition is supported in part by priming which is processed automatically (Jacoby, 1983); this issue is discussed in more detail below. According to the second view, recall depends on explicit (declarative) memory, while recognition is related to explicit and implicit (nondeclarative) memory. Recent findings do not support the idea that recall and recognition have close functional link to each other and are similarly impaired in amnesia (Haist, Shimamura, & Squire, 1992). However it seems that recall and recognition are related functions of declarative memory while their processes can also differ from each other in significant ways (Squire, 1994).

In a recall test, the subject is asked to produce past experience by remembering information, either via free recall or cued recall. Free recall refers to retrieving past information or events in terms of a wider and more sophisticated array of cognitive strategies which can be represented in several ways --such as words, actions, images and abstract propositions-- as a basis for reconstructing and producing the relevant stored information (Miller, 1984). An example of free recall is asking subjects to write down as many words as they can remember from a set of words which has previously been presented to them. In this task the subjects should try to remember the words without any external information to help them (Parkin, 1987). Children's performance on free recall is poorer than adolescents' and adults'. This is not related to less accuracy in what children recall, but because their recollections contain much less information (Fundudis, 1989). For example, Saywitz (1987) found that children under 10 years of age provided less material at free recall than adolescents, while, when the opportunity was given to the subjects to use recognition cues, the children were able to remember events not reported in free recall.

In a cued recall task, subjects are presented with some information to help them remember the target stimulus. For example, to try to remember those words starting with WA.. which have been presented earlier (Parkin, 1987). In a fragment completion task (a measure of implicit memory), the subjects should complete the fragment using the first word which comes to mind and whose first letters are the same as the first letters of the fragment.

In a recognition task, the subject is presented with a stimulus along with irrelevant information, and the subject has to decide which pieces of information have been presented before (Eysenck & Keane, 1990).

One of the clearest facts about memory is that it is usually much easier to remember previous events or experiences when memory is tested by recognition rather than by recall (Eysenck & Keane, 1990). Many experiments have shown that performance is best with recognition testing, followed by cued recall, and then recall (Parkin, 1987). Children are also more successful with memory based on recognition than recall tasks (Fundudis, 1989).

3.3.2.2. Nondeclarative Memory

Nondeclarative memory refers to knowledge to which the individual has no conscious access and describes a wide range of skill-based kinds of learning (motor skills, perceptual skills, and cognitive skills) habit formation, simple classical conditioning (including some kinds of emotional learning), priming (see below), and other knowledge expressed through performance rather than recollection. A similar concept to declarative memory is "implicit memory" which was proposed by Schacter (1987).

3.3.2.2.1. Priming

Priming refers to a technique developed to study how context influences performance. In other words this term refers to the improved facility for finding or processing a perceptual object on the basis of recent experience (Tulving & Schacter, 1990). Priming as a technique can measure responses to a second stimulus (target) as a function of its relation to a first stimulus (the prime). Hence the prime acts as a context for the target. For example, if subjects are presented with the word *crocodile,* then they are more likely to reply "crocodile" to the stem *cro-,* than if they had not recently encountered the word. The priming effect happens across a wide range of modalities, and generally depends on the repetition of the physical features of the original stimulus; it seems that priming is much less sensitive to semantic or conceptual aspects of the primed material (Tulving & Schacter, 1990). A body of studies suggest that the visual-word-form system serves priming effects on perceptual or implicit memory tasks such as stem or fragment completion, where the subject provides the first word that comes to mind in response to three letter stems or graphemic fragments and perceptual or word identification, where subjects try to identify briefly presented words (Schacter, 1994).

3.3.2.2.2. Procedural Memory

Procedural memory refers to the acquisition of skills, and is an action system. It is expressed in behaviour rather than in cognitive responses, for example riding a bicycle, walking, and swimming which are perceptual motor actions, or skills of reading, and problem solving which are related to cognitive action. Generally, it does not require conscious recollection of a given situation when the response or behaviour was learned (Nilsson, 1993). Skills include two types: continuous, and discontinuous. In the first type, each component of the skill serves as a cue to the next, as in driving a car, while in the second one, a series of different stimulus-response links are involved, as in typing. Forgetting can occur with discontinus tasks, whereas continuous tasks seem to indicate little or no forgetting (Baddeley, 1990). Neuropsychological studies suggest that motor-skill learning, which is one form of procedural memory, depends on the integrity of the basal ganglia (Butters et al., 1990). Tulving (1991) suggests that procedural memory is the oldest and episodic memory is the newest system. It seems that procedural memory is the most primitive system and the one to develop first in infants, while episodic memory develops after two or three years and is demonstrated only in higher mammals.

3.3.2.3. Everyday Memory

It has been argued that there are differences between memory as measured in the laboratory and memory as perceived and used in everyday life (e.g. Sunderland, Harris, & Baddeley, 1983; Baddeley, 1995). As Baddeley (1995) argues, the laboratory provides the simplification and experimental control that allows the precise testing of a hypothesis, whereas more naturalistic studies are essential if we are to evaluate the generality of our theories. Although traditional tests of memory give useful information to our questions such as "how an individual compares with the general population", or "whether a memory deficit is restricted to certain kinds of material", they fail to answer many of the questions relating to everyday life memory (Wilson, Cockburn, Baddeley, & Hiorns, 1989). Hence, some kinds of memory which happen in everyday life may be difficult to assess in the laboratory. Prospective memory, which is defined as a capacity to remember to do things in the future, is an example of this. Baddeley states that:

....When someone complains of a bad memory it is much more likely to be because of prospective memory lapses than because of a problem in learning lists of nonsense syllables or recalling complex geometric figures, and yet until quite recently psychology had nothing to say on the topic (1955, pp. 19).

To assess everyday memory, Wilson et al. (1989) developed a test of everyday memory that tried to cover a whole range of everyday memory lapses in scorable form. The Rivermead Behavioural Memory Test (RBMT) assesses such factors as remembering a name, learning a new route, recognising faces, orientation in time and place, and prospective memory. It also incorporates the recall of a short story. It has proved to be both sensitive and to correlate very highly with lapses of everyday memory, as measured by many hours of observation of patients by therapists (Wilson et al., 1989). In a subsequent follow-up study, it proved to be the best predictor of whether a patient would or would not be capable of living independently (Wilson, 1991). However, while the RBMT is an excellent predictor of everyday memory problems, it does not aim to provide an analytic estimate of memory performance.

As already mentioned, the main aim of this thesis is to study attention and memory in children and adolescents who suffer from PTSD. Memory is considered in two respects: (a) memory bias, and (b) general memory performance. The Stroop and attentional probe dot tasks were used to study attentional bias, while recall and recognition tasks were used to assess memory bias. To study general memory performance in young patients with PTSD on the Rivermead Behavioural Memory Test (RBMT) was examined.

3.3.3. Memory and Emotion

To study the relation between emotion and memory, investigators have used different types of memory task such as explicit (recall and recognition) and implicit memory paradigms with individuals with emotional disorders. According to cognitive theories the nature of the memory tasks are not the same. Explicit memory (recall and recognition) tasks assess emotional information directly, so the processing of information is strategic. While the mechanisim of implicit tasks is automatic and the emotional information is assessed indirectly. Mathews (1993) states that:

"Evidence of strategic influences on the recall of emotional information does not, of course, show that all selective encoding is strategic. ....Evidence of emotional effects on indirect tests would thus argue for the involvement of automatic processes" (Mathews, 1993 P. 496).

In the implicit memory task as noted above, subjects are required to complete word stems or word fragments with whatever word first comes to mind. Subjects are more likely to produce a word which they have encountered recently, although they do not recall having seen it before. For example, an individual is asked to complete the letters sel...with the first word to come to his or her mind. So s/he might say "selection" because he or she has read it recently rather than, for example "seldom". As already mentioned, in the explicit (recall and recognition) task the subject is asked to remember the words that have been presented previously. The detailed results of studies using explicit memory tests with emotional disorders (anxiety, depression and PTSD) are reviewed in Chapter 7.

3.3.4. Theories of emotional disorders

In the last two decades a number of influential cognitive approaches were developed to describe the relation between cognition and emotional disorders rather than normal emotions. In contrast to approaches to the understanding of normal emotion, cognitive theories of emotional disorders have usually focused on a specific disorders such as depression or PTSD rather than covering a range of emotional disorders. In the following section I will present two groups of emotional disorder theories. First, those theories which focused mostly on depression and anxiety disorders such as the schemata theory of Beck (1979, 1985), Bower's network model (1981, 1982), Lang's theory (1984, 1985), and Williams et al.'s model (1988). These cognitive theories have had an important role in the development of other models of specific disorders, for example Foa's model of PTSD was inspired by Lang's model. The second group of cognitive approaches attempt to explain PTSD in a cognitive framework, among these is Horowitz' model (1979, 1980) Creamer et al. (1992) theory, Foa et al.'s (1989) model, Brewin et al. (1995)'s dual-representation theory, and Power, Dalgleish's (1996) SPAARS approach.

3.3.4.1. Beck's Schema Theory

Beck and his colleagues (Beck, 1976; Beck, Emery & Greenberg, 1985; Beck & Freeman, 1990; Wright, Beck, Newman, & Liese, 1993) have suggested a cognitive model of information processing to explain the relationship between cognition and emotion and its implications for the emotional disorders. Originally, the cognitive therapy model was developed by working on depression and then, extended to other types of disorders such as anxiety, personality disorders and addiction. Beck's model was essentially based on clinical observations and a few experimental research studies. This model consists of two main components: cognitive structure (schema), and cognitive processing.

Cognitive structure (schema) is defined as a structured group of concepts which constitute the generic knowledge about events, scenarios, actions, or objects that has been acquired from past experience (Eysenck, 1994). The first systematic schema theory was developed by Bartlett (1932) who proposed the schema as a unity of knowledge stored in long-term memory, which influences information (particularly memory) processing. Cognitive structure (schema), has been used by a number of researchers such as Piaget (1948) and Rapaport (1951) to explain the cognitive functions of mind (Beck, 1976). Beck (1976, 1985) described the role of cognitive structure (schema) in information processing as follows:

....The organization is composed of assemblies or constellations of structural elements- namely, cognitive schema. The schema are the basic structural components of cognitive constellation. These schema are further organized into cognitive constellation, which are grouped into the subsystems, ...When specific schema or a constellation of schema is activated, their content directly influences the content of person's perceptions, interpretations, associations, and memories at a given time (Beck, Emery, & Greenberg, 1985; PP. 54,55).

Regarding the function of schemata, Beck and Clark (1988) pointed out that the cognitive structure or schemata guide the screening, encoding, organizing, storing and retrieving of information. Information which is compatible with the existing schema is elaborated and encoded, whereas incompatible or inconsistent information is forgotten. When a person is confronted with a particular situation, a schema which is relevant to the stimulus configuration will be activated. Individual differences in patterns of processing reflect differences in the schema which are active in the cognitive system. For example, Beck proposed that depressed patients' schema are "depressogenic" which are characterised by the processing of information along negative dimensions of concerning loss and failure, while anxious patients are characterised by "danger schema" which are activated by the processing of information related to threat and danger.

Beck suggested that in addition to schema, there is a superordinate organizing principle which plays an important role in organizing the concepts and rules regarding cognitive functions and which he termed a "mode". Each mode includes various groups of rules and concepts which are organized in terms of general themes. Regarding the relationship between schema and modes, Beck et al. (1985) state that:

........activation of the schema leads directly to consideration of the operation of a sector of the cognitive organization the modes. Under ordinary circumstances, the cognitive set varies in response to change in the nature of the stimulus situation. If the content persists over diverse situations, the set is reflecting the bias of a superordinate organization principle labelled the "mode". The mode is a subsystem of the cognitive organization and is designed to consummate certain adaptational principles relevant to survival, maintenance, breeding, self-enhancement, and so on (Beck, Emery & Greenberg; 1985, p 59).

So, according to this point of view, we have different modes such as depressive, narcissistic, hostility, fear or danger modes. The type of schema which is activated in the specific situation may be determined by a dominant mode that may be active at the time. Domination of a certain mode could also conceptualize the various syndromes in different disorders; for example, in depression, the self-constricting mode is hypervalent; or in anxiety the vulnerability or danger mode is highly activated. It is assumed that the activity of the modes is reflected in typical thinking characteristics of disorders due to the biased selection and processing of the information. Such conceptual errors may occur by misinterpretation, overgeneralisation, and exaggeration. According to Beck any biases result from the activation of the schema related to the content of the mode and also from deactivation of inconsistent schema.

The second main component of Beck's cognitive therapy is cognitive processing. When the cognitive system is confronted with a situation or stimulus, an automatic information processing occurs for selection, interpretation, and appraisal of the stimulus. As Beck and Emery (1985) emphasised the major feature of disorders such as anxiety and depression is the nature of cognitive processing, in other words the processing of specific information to produce negative automatic thoughts. Beck (e.g. Kovacs & Beck, 1977) proposed a "cognitive triad" in depression which is defined as negative attitudes towards the self, toward the outside world, and toward the future. The cognitive structure of depressed individuals leads them to assess themselves as deficient, inadequate, or unworthy. Depressed patients interpret their worlds as presenting obstacles which cause failure, deprivation, or disparagement. Regarding the future, depressed people's negative cognitive patterns lead them to believe the current difficulties or suffering will continue indefinitely and that there will never be an end to their frustration and deprivation. Therefore, such schema essentially produce a pervasive hopeless attitude. According to Beck, a distinguishing characteristic of the negative cognitive triad in depressed people is that the negative evaluations are unrealistic, distorted and illogical ways of thinking that do not correspond to reality.

According to Beck, the major similarities in information processing between anxious and depressed patients is that in both groups, maladaptive schemata regularly distort the processes which are involved in the perception, storage and retrieval of information.

In terms of differences between anxiety and depression, Beck and Clark (1988) proposed the content specific hypothesis. According to this hypothesis anxious persons have a heightened sense of vulnerability, which is related to physical or psychological threat. Anxious people's thoughts focus on negative events in the future, and their negative appraisals about people and events tend to be rather specific. In contrast, depressed persons are concerned primarily about loss, and their negative attitudes, as already noted, with are concerned with themselves, the world and the future, while their negative thoughts tend to be more pervasive and global than those of anxious patients.

In the case of PTSD, on the basis of Beck's model, it seems possible to speculate that when a person is confronted with a trauma, all information related to the trauma will be stored in the cognitive structure (schema) as a group of concepts. Later, when the traumatised individual is confrontated with any stimulus which is related to the traumatic situation, the traumatic schema which is relevant to the stimulus configuration will be activated. A particular pattern of information processing in PTSD refers to "traumatic schema" which are characterised by the processing of information related to the traumatic event. As PTSD is a sub-type of anxiety disorders, the content specific hypothesis might well apply. This would be cnosistent with PTSD patients' heightened sense of hyperarousal and avoidance, which is related to the traumatic situation and with the fact that PTSD patients' thoughts focus on avoidance from any cue-related to a traumatic event in the future, and that their appraisals about people and events past traumatic experiences.

In spite of many significant contributions of the cognitive therapy model, there are some limitations. The basic concepts are not clearly defined and are inconsistently used. Beck has suggested separate theoretical explanations which describe the cognitive systems of anxiety and depression (Beck et al., 1979). As mentioned earlier, Beck et al., (1985) have explained the similarities between the two models but several distinctions are also drawn between the two disorders. As noted, depression is particularly characterised by Beck in terms of a cognitive triad: a negative view of the self, of the world and of the future; whereas the cognitive style of anxiety is focused on the concept of danger schemata.

3.3.4.2. Bower's network model of emotion and cognition

Bower (1981; Bower & Cohen, 1982) explained the relationship between cognition and emotion in a network model. According to this model, all information (concepts, events, and emotions) in long-term memory (LTM) is stored as a number of "nodes" in a network. This theory has proposed associative models of memory networks, using the idea of a "proposition" as the basic unit of memory (Anderson, 1983; Anderson & Bower, 1973). The nodes are linked together, therefore they become associative structures providing a network. Activation of the appropriate nodes in LTM leads to accessibility of the information. When the nodes are stimulated or activated, such activation energy is transmitted via the associative connections, to other related nodes. Verbal or physiological symbols, via internal or external sources, can serve to activate the nodes. The activation also is selective and spreads from one activated node into the network to different degrees which depend on a number of factors including the proximity of the nodes, the power of the initial activation, and the time of lapse since activation. For example, related nodes are more likely to be activated than unrelated nodes. Bower argued that each emotional event is represented by a specific node in the LTM network which acts as a "focussing point" for all associated aspects of that emotion. Each emotion node has power connections with those nodes containing information causally linked to past occurrences of that particular mood state.

As noted above, the activation of each node will spread via the associative connections particularly to those related to mood-congruent information. Bower postulated that a wide range of cognitive operations (e.g., memory and attention) which require access to information from LTM should be facilitated when the required information is congruent with the current mood-state. Therefore, when a person is in an emotional state (e.g., anxious or with PTSD), the relevant emotional node is activated by any congruent internal or external stimulus and activation then will spread to associated nodes. These associated nodes will typically contain information which is congruent in mood with the experienced emotion. In the case of PTSD, all trauma-related concepts would become activated when the person is confronted with an experienced traumatic situation or any trauma-related cues. So, in the case of the current research, according to Bower's model the basic prediction is that all tasks involving access to stored information should demonstrate mood-congruent effects due to the increased activation of mood-congruent information.

According to Bower, the presence of mood congruent biases affects a wide range of cognitive operations, i.e., any cognitive process which requires access to information from LTM should be facilitated when the required information is congruent to the current mood-state. This mood-congruity effect suggests that people attend to and learn more about events that match their emotional state, while mood-state-dependent retention, refers to the fact that people recall an event better if they somehow reinstate the original emotion during recall, and the experience during learning (Bower, 1981). To explain the mood congruity effect, Bower emphasized selective reminding and emotional intensity. For example when one is sad, a sad incident in a story is more likely than a happy incident to remind one of a similar incident in one's life and vice versa when one is happy (selective reminding). The emotional intensity is that the strength of the mood congruity effect is a function of the emotional intensity of the memory. Data reported (Bower, 1981) have shown that mood induction led to mood-state-dependent memory, and a wide range of processes such as free association, social judgements, perceptual categorisation were influenced by it.

To explain a constellation of problems such as those formed in PTSD in terms of this model one would need to take a line similar to that of Foa (see below) and propose that all information related to the traumatic event is stored as a number of "nodes" in a network. All the traumatic nodes (reminders) are linked together, therefore they become an associative structure in the network. Activation of the trauma-related nodes in long term memory (LTM) leads to increased accessibility of other trauma-related information. When those nodes which are related to the traumatic situation are activated by a traumatic reminder, then such activation energy is transmitted, to other trauma-related nodes (reexperiencing). Following this activation a series of PTSD symptoms such as avoiding traumatic situations or reminders and hyperarousal will be demonstrated. Any kind of reminder, verbal or physiological, internal or external, could activate the trauma-related nodes. Processing of trauma-related stimuli in LTM would therefore be facilitated when the required information is congruent to the traumatic event. For a fuller discussion of the application of a version of network theory to PTSD, see the discussion of Foa's model below.

Although Bower's network theory indicates clearly the relationship between cognition and emotion, it seems to have a number of limitations: (a) As the theory predicts, each mood state should be associated with a range of biases such as attentional, perceptual, and memory. Williams et al. (1988), however, have suggested that anxiety is related to attentional biases, while depression may be more related to memory biases and that the results from research were not in agreement with the network theory prediction (see the detailed research reviews in Chapters 5, 6, 7). Bower (1987) also reported that experiments failed to support the network model regarding the predicted effects of mood on perception or to replicate some of the original mood state dependent retrieval effects. (b) In this model, the networks were originally designed to present the relations between individual words, therefore they are not necessarily appropriate for representing the structure of other forms of information such as events and actions (Dalgleish, 1996). (c) Bower's model fails to distinguish between different emotions and the predictions which the model generates must be taken as referring to all emotions in equal measure which is essentially a point for empirical investigation and is related to (a) above. (d) Bower offered very little discussion about the content of the emotional nodes and spread of energy along the links between nodes.

In summary, Bower's model was developed from experimental research with normal subjects and was concerned with the investigation of emotion and its impact on selective perception, imagination, thinking, and particularly state-dependency effects in memory. In contrast, the cognitive schema model of Beck (e.g., Beck & Emery, 1979; Beck et al., 1985; see above) has been developed within the field of clinical psychology, and examined patterns of thinking in emotionally disordered patients. As a consequence, Beck's ideas are more concerned with the differences between the structures of the cognitive systems normal healthy subjects and subjects with clinical disorders (such as those related to anxiety and depression) than are the ideas of Bower.

3.3.4.3. The cognitive model of Williams et al. (1988)

Network theory and schema theory both suggest a general bias in cognitive information processing of emotional disorders, but do not predict that different emotions may show different effects. Williams et al.'s (1988) review of the experimental evidence revealed that bias for mood-congruent stimuli is not shown by all mood-disordered people on every paradigm. A body of studies found attentional biases in anxious subjects (e.g. Mathews & MacLeod, 1985, 1986; MacLeod et al., 1986; see Chapters 5, & 6 for more details). However, depressed individuals have not shown such attentional biases (e.g. Gotlib & McCann, 1984). In contrast a considerable number of studies have found memory biases in depressed individuals (e.g. Bradley & Mathews, 1983; see Chapter 7 for more details), whereas findings with anxious subjects were negative (e.g. Mogg et al., 1987).

In order to try to account for this pattern of data, Williams et al. developed Graf and Mandler's (1984) distinction between two kinds of information processing, "integration" (priming) and "elaboration". As they state:

"Priming is automatic, occurring because the processing of a stimulus (e.g. a word) involves automatic activation of the multiple components involved in the representation of the stimulus. The result is a strengthening of the internal organization of the representation, making the word more "accessible"..... Elaboration, a more strategic process, consists of activation of a representation in relation to other associated representations to form new spread of activation to associates produced by this process of elaboration is to make the word more "retrievable" because such elaboration generates new and reinstates old paths for retrieving the word" (p. 170-171, 1988).

Williams et al. reviewed a considerable number of studies with clinical and sub-clinically anxious and depressed subjects to study this distinction with different emotional disorders. Regarding anxiety, Williams et al. suggest that integrative or automatic priming processes are biased towards the detection of anxiety-relevant stimuli. In other words, the biases due to early selective processing of emotional information in anxious subjects must be automatic, and pre-attentive. At the pre-attentive stage of processing, they propose, there is a decision mechanism for assessing the threat value of a stimulus. Bias arises because priorities for subsequent processing are determined, and resources are oriented towards or away from the source of the stimulus. Normal subjects tend to orient processing resources away from the location of a cue which has been processed as a threat whereas anxious subjects orient towards.

As noted above, elaboration, which is a strategic process, consists of the activation of the representation in association with other related representations and the structure of new pathways of activation between them, as well as the strengthening of existing pathways. The elaboration process is encoded with the representation and is able to act as a mnemonic pathway for recognition and recall, even in neutral mood. Therefore, due to this process, the representation will be more retrievable. According to Williams et al., depressed patients process negative information in an elaborated or strategic way.

So the integration/priming process increases the probability that information will be produced (or seen, or heard) when only some of its components are presented, while elaborative processing is required to find the relations among a set of unrelated pieces of information (words) and to relate the occurrence of a word to its context (Graf & Mandler, 1984). The decision by Williams et al. to regard 'integration' and 'priming' as synonymous processes is a potentially confusing one. Priming effects are generally conceptualised as operating on more than one representation in memory (as evidenced by the semantic priming effect, e.g., Neely, 1977) and as such priming shares some of the features assigned by Graf & Mandler to the process of elaboration. In contrast, Graf & Mandler make it explicit that the hypothesised process of integration that they describe is representation specific.

Regarding the lack of attentional bias effects in depression, Williams et al. propose that attentional processing is prevented in depressed individuals by resources being allocated away from the stimulus. They interpret studies of attentional biases in depression either as direct evidence that depressed subjects did not show such biases (MacLeod et al., 1986) or as evidence that anxiety levels were not considered for those studies in which attentional biases have been reported for depression (e.g. Gotlib & McCann, 1984).

In contrast, Williams et al. (1988) in their explanations as to why memory bias is related to depression but does not generalise to anxiety disorders, suggest that "in some types of disturbance there may be strong tendencies to direct processing resources away from valent (phobic) material at the elaboration stage. In this case, fewer mnemonic cues would be stored with an item rendering it less retrievable " (p. 172). It seems that this automatic processing is biased towards the detection of threat in anxiety, but that subsequent elaborative processing is biased away from the processing of threat (Williams et al., 1988).

There is evidence supporting Williams et al.'s view that some types of emotional information processing depend on automatic (integrative) processing, while others involve more strategic (controlled) operations. However, it has been argued by others that both of these processes (automatic and strategic) also involved in most emotions (Bargh & Tota, 1988).

However, Williams et al.'s (1988) have proposed a model of the information processing systems involved in emotional disorders which tries to offer a clear distinction between cognitive features of the two main disorders i.e. anxiety and depression using two different sets of tasks which assess automatic and strategic processing.

In the case of PTSD, findings of studies on attention and the only study on memory bias with PTSD individuals were consistent with those of anxiety disorders (see Chapters 5,6, and 7 for detailed reviews). Stroop data suggest that PTSD patients showed an attentional bias towards trauma-related stimuli (e.g. Thrasher et al., 1994), while a strong memory bias (recall and recognition) was not found (Zeitlin & McNally, 1991). So the cognitive pattern in PTSD is the same as for other anxious subjects. Integrative or automatic processes are biased towards the detection of trauma-related cues. In other words, the attentional bias in PTSD seems to reflect the early selective processing of traumatic information which is automatic, and pre-attentive.

It is important to say that the Williams et al. model is well supported by experimental evidence which makes it a useful contribution to cognitive psychology. It seems that terms such as the concept of inhibition (a basic concept in understanding the processing of emotional information) which has been used by this model theoretically and practically are well defined and described. However, it contains some unclear points about the relationship between pre-attentive effects, automatic effects and attentional bias effects and, therefore, has some limitations as a proper cognitive model of anxiety or depression.

3.3.4.4. Lang's Theory

Lang (1979, 1984, 1985) advanced another network approach to emotions. He maintained that emotional information is a construction of memory which is coded in the form of propositions and these propositions are organised into associative networks. The activation of each element will spread through the other components of the network. Lang suggested that the emotion memory structure contains three types of information as follows:

(1)- Information about external stimuli and their occurrence context.

(2)- Information about physiological, behavioural and cognitive responses to the stimuli.

(3)- Information about the interpretation of the stimuli and response data.

Lang postulated that the information network of an emotion is a kind of schema, which, when a series of propositions are accessed by external or internal stimuli or both will process as a unit. The schema network also is associated with a production system which includes two components, an information analysis program and a program for response generation which are roughly equivalent in activation to the cognitive work of emotional expression.

Lang developed his theory focusing on the study of fear, particularly in pathological manifestations in phobias. The network is the declarative knowledge and the procedural knowledge (test program and motor plane) is in the production system. Phobic signs are produced when a series of input concepts match those in the network. Lang suggested that the probability of a phobic production is determined by the number of matching propositions which are present in short-term memory. Network activation occurs when the phobic person is confronted with a real phobic object which is assumed to be a stimulus match. Lang has also suggested that most of the stimuli which are related to the actual phobic object such as pictures, verbal descriptions and so on can elicit the phobic emotion. The schema may be activated as a unit by media, instructional or sensory input, which contains information (in the conceptual form) matched in the network.

Although Lang's theory was not intended to explain PTSD directly, it has influenced cognitive theories of PTSD. For example, Foa et al. applied Lang's model in their explanation of PTSD. This model is discussed in the following section which reviews cognitive theories of PTSD.

3.3.5. Cognitive Models of PTSD

In the last decade, a number of cognitive approaches to PTSD have been developed with considerable interpretive and predictive power. Most of them place emphasis on certain theoretical assumptions which propose that traumatised individuals take to the traumatic experience a set of pre-existing beliefs and models of the world. The traumatic experience presents information which is incompatible with these pre-existing models (Dalgleish, 1996). It has been argued that the efforts to absorb the new information within the existing models leads to a variety of symptoms which make up the post-traumatic stress reaction. In this situation, successful processing will happen when the new information is integrated into the existing models. Unsuccessful processing occurs when the individual is unable to reconcile the new trauma-related information with the current models of the world. This can lead to pathological post-traumatic reactions such as PTSD.

Although cognitive theories endeavour to explain both the empirical and clinical findings relating to PTSD, most of them do not account for all the information which is related to the disorder. In this view, cognitive theories of PTSD can be divided into two distinct groups. First, social-cognitive theories (e.g. Horowitz) emphasise the impact of the trauma on individuals' lives and the processing and integration of the traumatic experience into pre-existing experiences of the world. This leads them to offer good description of other reactions such as anger, anxiety, and depression, which often accompany PTSD. Second, information processing theories (e.g. Foa et al., 1989) focus more on trauma-related threat, and the representation and processing of the traumatic information in the cognitive system. The following section describes these two groups of cognitive theories.

3.3.5.1. Horowitz' Information Processing Model

Horowitz' (1973, 1976, 1979, 1980,1986, & 1990) model of PTSD has been one of the most influential social-cognitive models. It places a major emphasis on information processing and cognitive formulations of emotion, although it has been influenced by classical psychodynamic psychology (e.g., Freud, 1920 see chapter two). According to Horowitz, traumatic events involve heavy amounts of internal and external information. Most of this information cannot be matched with an individual cognitive schema, therefore it is not integrated into memory and leads to information overload. One of the basic elements of Horowitz' theory is "a completion tendency" which is defined as the psychological "need to match new information with inner models based on older information, and the revision of both until they agree" (Horowitz, 1986; p. 92). Horowitz has argued that there are different phases in this processing of the traumatic information as follows:

(a) massive stress and crying out; at this stage the individual is confronted with a traumatic event and displays an immediate response to the catastrophic event. It contains a fast unconscious appraisal of the self and the event and leads the person to demonstrate various emotions such as fear, sadness, anger and even physiological changes. These reactions are always followed by an information overload stage in which the traumatic thoughts, images, and memories cannot be matched with the current schemata.

(b) When an individual cannot process the information, various psychological mechanisms come into play to reduce the emotional flooding and help the individual to keep the traumatic information out of awareness and therefore, it remains as unprocessed active information. In this situation, denial and numbing are employed as defensive mechanisms to keep the traumatic information unconscious. Horowitz explained the avoidance stage as a consequence of active inhibitory efforts. If conscious, these mechanisms are called suppression and if unconscious, they are called repression (Horowitz, 1990).

(c) Intrusive thoughts such as flashbacks, repetitive nightmares, and unwanted thoughts can be produced at all levels of traumatic information processing as a result of the completion tendency. The intrusive thinking may continue for days, weeks, and even months. The thoughts intrude on consciousness until the traumatic information is processed. In this situation, avoidance reactions are again recruited to reduce the emotional flooding. According to Horowitz, the tension between the completion tendency and defensive mechanisms causes individuals to fluctuate between intrusion and avoidance until they integrate the traumatic information with their prior experiences.

(d) At the transition phase, there are recurrences of avoidance and intrusive phenomena, and the oscillation will continue between the two sides to promote balance. During this phase, periods of relaxation occur during which neither defensive manoeuvres nor emotional flooding is distinguished.

(e) Integration, which is characterised by completing the processing of traumatic information, is not actually a phase. The processing of information continues until the new information integrates with preexisting information or becomes part of the cognitive model and inner schema. Failure of such processing causes the activation of traumatic information without complete integration, therefore leading to chronic post-traumatic stress disorder.

Generally, Horowitz has developed a comprehensive model of PTSD. His explanation of the processing of the traumatic event which leads to the symptoms such as intrusion and denial has considerable explanatory potential for PTSD phenomenology. This model also suggests the ways in which normal reactions to trauma can become chronic or pathological. However, Horowitz' explanation of PTSD has some limitations (Dalgleish, 1996).

1-There is little discussion as to why similar traumatic events have different effects on individuals. Indeed, this model does not pay attention to the nature of the existing schema structure and the ways in which it fails to adapt to new information from the traumatic experience.

2- Horowitz' formulation offers no attempt to account for epidemiological data regarding the frequency of late onset, though this could be associated with a long period of denial which later breaks down.

3- Although Horowitz presents an obvious description of the time course of PTSD, it seems that individuals do not always experience an initial period of denial, or later oscillations between denial and intrusion.

4- Although Horowitz highlights the importance of processes such as social support, there is little explanation within the model of how such factors might operate.

In terms of attentional or memory biases, although Horowitz' model has emphasised the information processing of trauma-related material in PTSD patients, the model does not discuss the elements of the cognitive structures of information processing (e.g., attention and memory) and is therefore agnostic with respect to the presence or absence of processing biases.

3.3.5.2. Janoff-Bulman's cognitive-appraisal model

Janoff-Bulman (1985, 1992; Janoff-Bulman & Frieze, 1983) proposed a cognitive-appraisal model of PTSD. According to Janoff-Bulman the nature of the pre-existing models of the world which the individual carries into the traumatic situation plays an important role in developing PTSD. In this model there are three basic assumptions that combine to create the person's estimation of their own invulnerability: (a) Personal assumptions of invulnerability, (b) the world as meaningful and comprehensible, and (c) seeing the self in a positive and worthy way. Janoff-Bulman suggests that these assumptions provide a meaningful cognitive structure in the individual's life. The basic concept which this model uses to explain PTSD is that of 'shattering'. When an individual is confrounted with a traumatic situation the structure of the basic assumptions will break down or shatter and consequently the individual will fall into a confusion of intrusion, avoidance and hyperarousal. The victim is faced with the dilemma, of trying to reconcile the trauma with prior assumptions that are no longer adequate but with a negative experience that is too overhelming to ignore. Thus, the individual must revise and rebulid his / her basic assumptions.

Although, Janoff-Bulman's model describes the ways in which trauma-related information is incongruent with the usual models and assumptions about the world which people possess, there is little attempt to explain how such models are represented or what processes are involved when they are shattered (Dalgleish, 1996). It seems that this model also has problems in the explanation of individuals who develop PTSD following a trauma but who have a pre-morbid psychiatric history. Such individuals would most likely be characterised by assumptions of personal 'vulnerability' and views of the self in a 'negative' light. Therfore, seems that such premorbid negative assumptions ought not to be shattered by a traumatic experience.

Like Horowitz' model, although Janoff-Bulman's says a little about biases in individuals who suffer from PTSD.

3.3.5.3. Foa's Fear Network Theory

Foa and her colleagues (Foa & Kozak, 1989; Foa & Riggs, 1993; Foa, Steketee & Rothbaum, 1989; Foa, Zinbarg & Rothbaum, 1992) inspired by Lang's analysis of fear structures (e.g. Lang, 1985; see above) explain PTSD symptomatology in an information-processing model. Foa et al. maintain that fear networks consist of three types of information: information about the traumatic stimulus, information about cognitive, physiological and behavioural responses to the trauma and information about the interpretation of the stimulus and response elements of the structures. The fear network can be activated, they argue by triggering stimuli (such as reminders of the trauma) which causes information to enter consciousness in the network (the intrusion symptoms of PTSD). In this situation, the individual endeavours to avoid and suppress such activation which leads to the avoidance symptoms. If the information in the fear network integrates with the memory structures, then resolution regarding the trauma information will occur. According to Foa et al., modification of the fear network by activation on the one hand and modification of the memory structures by availability of the information which is incompatible with the fear network are two main factors in integration. Foa et al. have attempted to explain the aetiology of PTSD by the lack of predictability and controllability of traumatic events or unconditioned stimuli as Foa et al. have called them. Controllability is "the probability that a given response will prevent or terminate the unconditioned stimulus (US)" (Foa et al., 1986, p. 222). Predictability is determined "in terms of the probability of the onset or termination of the US given the presence or absence of a given signal" (Foa et al.; 1986, p. 222). Foa et al. have argued that the unpredictability and uncontrollability of the traumatic event cause problems in its integration with a cognitive model in which the world is controllable and predictable; regarding this issue they have stated that:

"......what distinguishes PTSD from other anxiety disorders is that the traumatic event was of monumental significance and violated formerly held basic concept of safety. That is to say, stimuli and responses that previously signalled safety have now become associated with danger. In this way, one's world becomes less predictable and controllable" (Foa et al., 1989, p 166).

Additionally, some other factors such as the severity of the event, the intensity of the responses (both physiological and behavioural), and the low threshold for activation of the fear structure cause disruption of the cognitive processes of attention and memory during the traumatic event. Hence, this disruption contributes to the formation of a disintegrated fear network which is difficult to integrate with premorbid cognitive structures.

Foa et al. have focused more on understanding the processing of traumatic information in a cognitive system than, for example, Horowitz. Controllability and predictability also highlight the role of the individual's interpretations and attributions of the traumatic event. Furthermore, according to Foa et al., the availability of information incompatible with the trauma provides a framework for understanding the role of social support in processing the information and also of the treatment of PTSD. However there are a few limitation in the network model. First, it seems that network theory could not present an architecture powerful enough to cope with the whole range of PTSD phenomenology. Second, Foa et al. have paid less attention to describing why fear networks develop in some individuals and not others.

Foa et al. make some predictions concerning information processing, particularly biases in PTSD. Foa et al. Suggest that individuals with PTSD will selectively attend to and remember trauma-related information. Consequently, the kind of biases used in the present research should reveal biases for this information.

3.3.5.4. The Cognitive Processing theory of Creamer, Burgess, & Pattison (1992)
Creamer et al. (1992) have proposed a cognitive model of PTSD which is a combination of Horowitz' formulation (1976, 1979 & 1990) and the network conceptualisation of Foa et al. (1989). They suggested five stages for processing trauma-related information as follows:

(a) Objective Exposure: The severity of exposure to trauma does not directly affect the following adjustment but the influence of it will be mediated by processing variables.

(b) Network Formation: The traumatic memory network will be determined by traumatic experience including stimulus, response, and meaning propositions. The level of exposure is important at this stage, because it predicts the level of intrusive thoughts.

(c) Intrusion: According to Creamer et al. "the intrusive memories can be conceptualized as processing". Some of them are functional and are associated with decreased levels of symptoms, while others are dysfunctional and result in high levels of arousal which precedes avoidance and escape as coping strategies. Creamer et al. predicted that the high levels of intrusion associated with high levels of symptoms are a predictor of successful recovery whereas low levels of intrusion are associated with chronic pathology.

(d) Avoidance: When the memory network is activated, it will cause reexperiencing phenomena. Network activation produces high levels of physiological and psychological arousal. In this situation the individuals endeavour to escape by avoidance of reminders and traumatic memories which will reduce the activation of the fear network. The amount of avoidance and escape responses is associated with the degree of intrusive thoughts and with the preexisting style of coping.

(e) Outcome: When traumatic events occur, then activation and modification of the memory network cause the psychological symptoms. Recovery will result when the symptom level is reduced by the mechanism of network resolution processing. Creamer et al. suggested that the degree of intrusive thoughts can be used as an indicator of this network resolution processing. According to their experimental findings, high levels of intrusion are a predictor of successful recovery while, low levels of intrusion are a predictor of poor recovery.

Creamer et al. attempted to support their model with experimental evidence. They carried out a study with victims of an office block shooting in Australia. The results of this longitudinal study supported their model and previous cognitive processing conceptualizations of PTSD (Foa et al., 1986; Horowitz, 1986). In this model intrusion as a powerful predictor of global severity, provides a cognitive processing model of posttrauma reaction. The memory network contains not only the content of intrusive memories but also response information, notably in the affective and physiological domains. So, the occurrence of intrusive thoughts indicates that the memory network has been activated and the individual's appraisals of the event influence both initial and long-term reactions. Thus, any interpretation of the events is likely to be accompanied by processing biases and according to this model, PTSD patients should show biases towards trauma-related information.

3.3.5.5. Brewin's Dual Representation Theory

Brewin, Dalgleish and Joseph (in press) attempted to apply Brewin's dual representation theory (1989) to PTSD. According to this approach, there are two levels in memory in which trauma-related information can be represented, Verbally Accessible Memories (VAMs) and Situationally Accessible Memories (SAMs). VAM representations which contain sensory, response and meaning information about the traumatic event are characterised by their ability to be intentionally retrived and progressively edited by the traumatised person. SAMs contain information which cannot be intentionally accessed by the person and are accessed only when aspects of the original traumatic situation cue their activation, for example, flashbacks would be considered to be the result of the activation of SAM representations, while the person's ability to recount the trauma in a therapeutic situation, would be a function of the VAM representation.

According to this approach dealing with trauma-related information advances on two fronts by the processing at the VAM and SAM levels. Brewin et al. (In press) have proposed that persons consciously integrate the verbally accessible information in VAM with their preexisting beliefs and model of the world and negative affect is reduced by a resultant sense of safety, control and appropriate adjustments about the self and the world. The activation of information in SAM through exposure to traumatic cues is the other part of emotional processing in PTSD. This emotional processing usually happen automatically when the person starts to edit VAM information progressively. Brewin et al. suggest that successful emotional processing of VAM and SAM information regarding the trauma may not always be possible, therefore in some situations when the difference between the trauma and prior assumptions is too great, emotional processing of trauma-related information will become chronic.

It seems that Brewin et al.'s model suffers from some limitations: (a) although Brewin et al. by presenting a dual representations view try to move away from single level theories (e.g. Foa et al.), the model does not explain some important factors such as how higher-order models or assumptions about the world and the self are represented. (b) the model is also not clear about how the integration of VAM information related to the trauma with pre-existing information occurs and finally, (c) this model does not make clear the relation or integration of VAMs and SAMs in the cognitive system. However, this model does make some predictions about biases for to traumatic event information and proposes about individuals with PTSD should exhibit memory and attention biases for trauma-related information.

3.3.6. Summary and conclusions

At the beginning of the chapter two types of cognitive functions were defined, attention and memory. Attention refers to selection of stimuli for future processing (Eysenck, 1991), and exists in two forms, focused-attention and divided attention. Theoretically, memory consists of three stages encoding, storage and retrieval which are important in the interpretation of different biases (e.g. automatic or strategic processing of information) and in the later chapters this is discussed in more detail. Long term memory is of two sorts, (a) declarative memory to which an individual has conscious access and the contents of which can be stated directly either verbally or by some other means; this includes semantic memory (general knowledge) and episodic memory (personal knowledge). Recall and recognition are two ways to assess declarative memory. (b) non-declarative memory is knowledge to which the individual has no conscious access and can only be demonstrated indirectly through some form of action such as skill priming. Everyday memory which is different in nature from long term memory was also described.

The second part of the chapter reviewed the various cognitive theories of emotional disorder. Four cognitive theories of emotional disorder were considered: Beck's (Beck

& Emery, 1979; Beck et al., 1985); Bower's (e.g. 1981); Williams et al's. (1988); and Langs' (e.g.1985). The models of Beck and of Bower, although developed independently, make similar predictions about the effects of anxiety on the processing of emotional information. Both of them suggest that all cognitive processes which deal with threat--related information will show biases in favour of that information in anxious subjects. Alternatively, the model of Williams et al. argues for a dissociation between attentional processes and memory processes and proposes that subjects with anxiety states will show attentional biases towards threat-related information but no corresponding memory bias. According to Williams et al.'s model, PTSD patients should show attentional biases towards trauma-related material, while they should exhibit no memory biases.

Finally, the last part of this chapter considered specific cognitive models of PTSD, Horowitz (1979), Foa et al's. (1985), Creamer et al's. (1992), and Brewin et al's. (1995). All of these theories share certain core theoretical assumptions. They suggest that individuals with PTSD bring a set of pre-existing experiences to the traumatic event. These two sets of information are incompatible with each other, and the attempt to assimilate the new information with existing information leads to various phenomena which characterise the post-traumatic reactions. If the individual is able to integrate the new information into the existing representations, then successful processing will occur, lack of ability in integration of the new information into the existing information leads to pathological post-traumatic reactions such as PTSD. It seems that according to most of these models, PTSD patients should perform on cognitive tasks (e.g. the Stroop) in a different way from normal controls; thus is, they will show a bias towards trauma-related information at least on attention tasks and perhaps on memory biases.

CHAPTER 4

The Development of a Corpus of Emotional Words Produced by Children and Adolescents.

4.1. Introduction

According to some theorists including Beck and Emery (1985), Beck and Clark (1988), Bower (1981, 1987), Williams et al., (1988), there is a strong relationship between cognition and emotion (see Chapter 3 for a review of the theories). Recently a number of researchers (see Mathews & MacLeod, 1994; for a review) have tried to study this relationship using various experimental paradigms. They have studied cognitive biases in memory, attention, and interpretation in emotional disorders such as anxiety and depression (see Chapters 5 to 8 for a review of the literature). In these paradigms, words with different emotional content (for example, threat, sad, happy, and neutral) are used as stimuli. The frequency, length, emotionality, and self-relevance of the words are four factors which influence subjects' responses to such tasks and this, therefore, suggests that the words used in the tasks should be matched on these dimensions. To develop experimental tasks for adults, words with different emotional content are chosen from available sources and used as a stimuli. There are no published sources containing the frequency of usage of emotional words by children and adolescents. The purpose of this study therefore, is to develop a pool of emotional words collected from children and adolescents. This study was performed in collaboration with two other Ph.D students.

While there are studies of emotional words produced by adults (for example John, 1988; Johnson-Laird & Oatley, 1989; Goozen & Frijda, 1993), only one study has been published on children. Whissell and Nicholson (1991) studied children's production of synonyms for seven key emotions: happy, sad, afraid, mad, comfortable, proud, and guilty. They interviewed 74 children from Kindergarten, Grades 4, and 8 (aged 5, 9, and 13) individually and asked them if they knew any other word that meant the same feeling as "-------". If they gave a response, subjects were prompted with the same question to a maximum of five prompts or until they failed to give an answer. Results from their study have shown that children produced more synonyms in Grades 4 and 8 than in Kindergarten, and more children from Kindergarten were unable to produce synonyms than from the higher Grades. A significant emotion effect was discovered for the total number of synonyms and the total of unique synonyms. For these variables, the words 'proud' and 'guilty' were associated with the lowest number of synonyms, while the words 'happy' and 'sad' were associated with the highest. At the kindergarten level only, boys produced more synonyms than girls. There was no significant improvement in task performance between Grades 4 and 8, although children's general vocabulary is still increasing at this time.

4.2. Method

4.2.1. Subjects

Two hundred and twenty one children including 109 students from two primary schools (47 boys and 62 girls; mean age = 10.1 years, SD = 0.65) and 112 students from four secondary schools (44 boys and 68 girls; mean age = 14.29 years, SD = 1.4) in London, participated in this study in 1993 and 1994, as shown in Table 4.1.

Table 4.1. Number of subjects in primary and secondary schools, means of age in years and standard deviations (SD).

School	Primary			Secondary			Total		
Sex	Girl	Boy	Total	Girl	Boy	Total	Girl	Boy	Total
Number	62	47	109	68	44	112	130	91	221
%	56.9	43.1	100.0	60.7	39.3	100.0	58.8	41.2	100.0
Age (y.)	10.10	10.07	10.10	13.98	14.75	14.29	12.50	14.52	12.23
S.D.	0.62	0.69	0.65	1.30	1.44	1.40	2.18	2.60	2.36

4.2.2. Measures

There are different methods of assessing emotional word usage in children; for example: collecting emotional words from books which have been written for children by adults;

extracting words from children's own writing; using pictures to represent different emotional states and asking children to write in a single word the emotional states represented; collecting the emotional words used in clinical tests for children such as depression or anxiety scales; and, choosing words from related adult research and then asking children whether or not the words have a similar meaning for them.

All these methods have disadvantages. Words which are written by adults for children may not have the same meaning and importance for children. Children's own writings and words produced by children of emotional states represented by different pictures do not provide enough emotional words, and problems of distinguishing and categorising the collected words still remain. It seems that the most appropriate way is to ask children to imagine examples of different emotional states such as happiness, sadness, and then write down as many emotional words which come to their minds in a limited time.

A questionnaire was therefore developed including 10 questions focusing on three emotion-like states (happiness, sadness, & threatened), two types of self-descriptive adjectives (positive & negative), and two neutral categories (semantically related & semantically unrelated). In order to prompt children to produce more words for each emotional state, two types of questions were asked. This means for a state such as happiness, one of the questions asked subjects to write single words to describe happy feelings and another asked them to write single words for things which can make children happy.The questionnaire comprised eleven pages (A4 Form). The first page contained instructions, as follows:

"Dear student :
We are interested in what words boys and girls use to describe how they feel in different situations.
We would like you to answer the following questions. Please note that none of the questions have right or wrong answers. You should write down all of the words related to each question immediately they come into your mind.
Thank you very much."

One question was written at the top of each of the remaining ten pages in bold form. Below each question, there were 20 spaces numbered from 1 to 20 in which subjects could write down responses. The subjects were given up to 5 minutes per page.

4.2.3. Pilot studies

Two pilot studies were conducted with 40 primary school pupils. The pilot studies indicated that young children had difficulty understanding the meaning of some of the original words such as "THREATENING" used in the questionnaire. Such words were changed to easier words such as "SCARY". The questionnaire comprised three types of questions: negative, positive and neutral. Responding to negative questions made children tired and the negative and positive questions were therefore alternated. The two neutral questions were put first and last. Both of these questions are easy and therefore starting the questionnaire with one of them should reinforce children to answer the rest of the questions (Appendix 4.1 shows the questions).

4.2.4. Procedure

Class teachers, in the presence of two of the investigators, read aloud the test instructions while the students were looking at the first page. Students then had the opportunity to ask questions which were answered by the investigators. The teacher then read aloud the first question and asked the subjects to write down their responses in 5 minutes. The other questions were administered in the same way. The test was administrated in two parts with a 10 minute break between the 5th and 6th questions.

4.2.5. Modification of collected words

Having collected the data and entered them into a computer, some modifications were made to the raw data as follows:

1- All Plural words were written in singular form (e.g. dogs changed to dog).

2- One form was chosen to represent words which also appeared in abbreviated form (e.g. T.V. and television).

3- The gerund words and their verbs (e.g. play and playing) were written in verb form, provided that the meaning of both words did not differ (cf. beat and beating).

4- Where possible, the phrases or sentences written by subjects were changed to a single word, otherwise they were omitted.

5- Adjectives with different suffixes (e.g. "ing", "ful", "ed" etc.) were written in a single form, provided that their meaning was not changed.

6- All the words which occurred only once were omitted.

4.3. Results

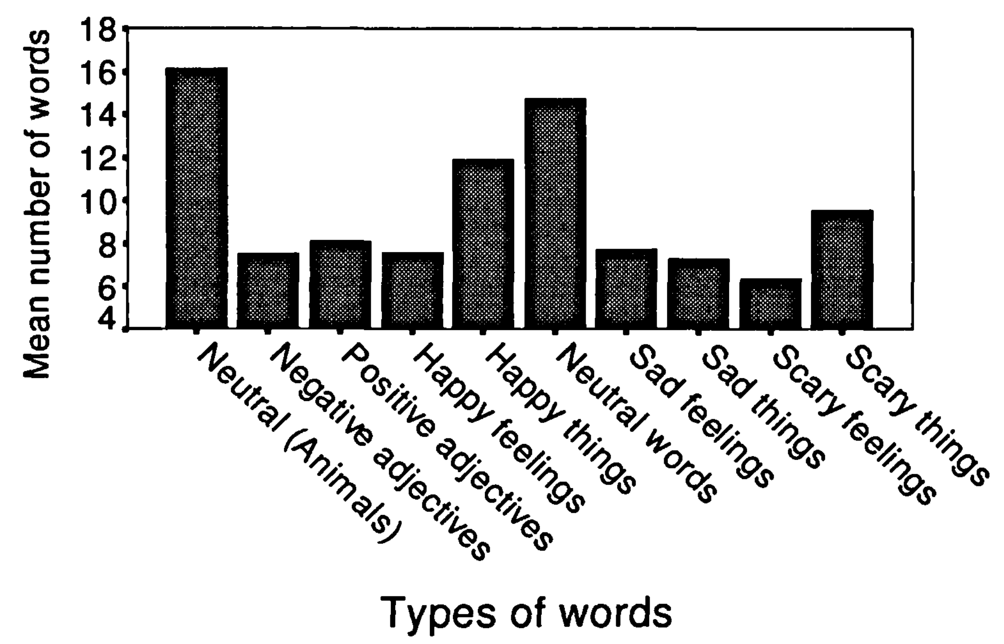
Subjects produced about 21,000 words in total across the different groups of words. On average, each subject produced 96.78 different words (SD=34.68). The numbers of words produced in the different categories are presented in Table 4.2.

Subjects produced more words in the categories: "semantically related words(Animals)", "semantically unrelated words" and "happy things" than in other categories. They also produced fewer words in the categories "scary feelings", "sad things" and "negative self-descriptive adjectives" (see Figure 4.1).

Table 4.2 Means and standard Deviations (S.Ds) of the numbers of words produced by primary and secondary school students

School	Primary school			Secondary school			Total		
Sex	Girl	Boy	Total	Girl	Boy	Total	Girl	Boy	Total
N	62	47	109	68	44	112	130	91	221
Neutral	14.87	13.28	14.18	15.85	14.27	15.23	15.38	13.79	14.71
S. D.	5.98	5.64	5.87	4.91	6.44	5.59	5.45	6.03	5.74
Animals	16.26	14.70	15.59	17.28	15.55	16.60	16.79	15.11	16.10
S. D.	4.14	5.03	4.59	3.40	5.82	4.56	3.79	5.42	4.59
Positive (adj)	8.39	7.15	7.85	9.53	6.45	8.32	8.98	6.81	8.09
S. D.	4.43	3.38	4.04	5.11	3.23	4.70	4.81	3.31	4.38
Negative (adj)	7.24	6.53	6.94	9.37	6.20	8.13	8.35	6.37	7.54
S. D.	3.30	3.46	3.38	5.84	3.90	5.37	4.90	3.66	4.53
Happy feelings	8.18	7.06	7.70	7.47	7.36	7.43	7.81	7.21	7.56
S. D.	3.94	2.75	3.51	5.55	3.84	4.93	4.85	3.31	4.28
Happy things	12.52	10.53	11.66	14.06	9.00	12.07	13.32	9.79	11.87
S. D.	5.23	5.20	5.28	4.75	4.61	5.29	5.03	4.96	5.28
Sad feelings	6.66	6.47	6.58	11.09	5.25	8.79	8.98	5.88	7.70
S. D.	3.42	3.63	3.49	5.83	2.62	5.60	5.30	3.22	4.80
Sad things	6.79	5.30	6.15	8.75	7.82	8.38	7.82	6.52	7.28
S. D.	3.78	3.06	3.55	5.88	4.90	5.51	5.07	4.23	4.77
Scary feelings	6.31	5.57	5.99	7.32	5.95	6.79	6.84	5.76	6.39
S. D.	3.52	3.78	3.64	5.95	4.01	5.30	4.95	3.87	4.56
Scary things	7.85	7.89	7.87	13.85	6.95	11.14	10.99	7.44	9.53
S. D.	4.43	4.60	4.49	5.46	4.40	6.08	5.81	4.51	5.59
Total number	95.06	84.49	90.50	114.57	84.82	102.88	105.27	84.65	96.78
S. D.	29.51	27.83	29.15	38.42	31.16	38.48	35.70	29.32	34.68

Figure 4.1:The distribution of words produced by subjects in different categories

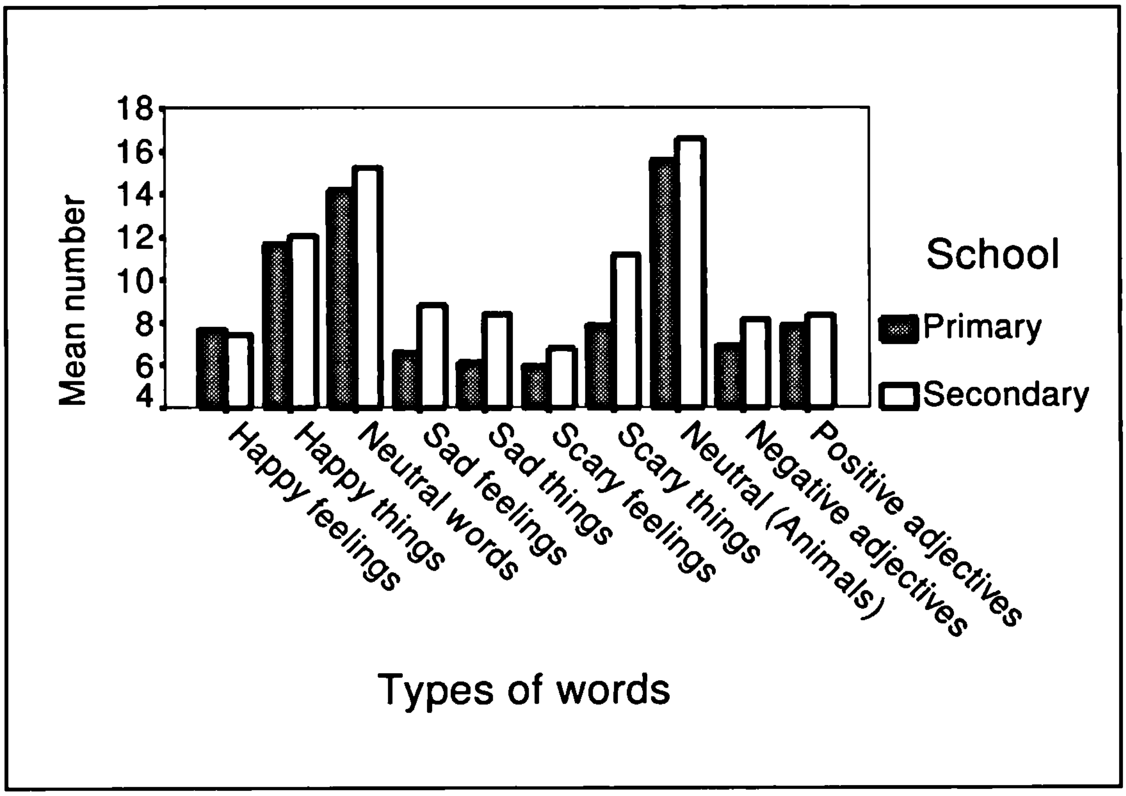


In a School (2) x Sex (2) x Word Type (10) analysis of variance with repeated measures on the last factor, the effects of School, [$F(1, 217) = 4.97$, $p < 0.05$]; Sex, [$F(1, 217) = 20.56$, $p < 0.001$]; and Word Type, [$F(9, 1953) = 199.37$, $p < 0.001$]; were significant as were the interactions of School x Sex, [$F(1, 217) = 4.65$, $p < 0.05$]; School x Word Type, [$F(9, 1953) = 3.57$, $p < 0.001$]; Sex x Word Type, [$F(9, 1953) = 4.44$, $p < 0.001$]; School x Sex x Word Type, [$F(9, 1953) = 7.72$, $p < 0.001$]. These results are deconstructed as follows:

4.3.1. School Effect (Primary Vs Secondary)

Subjects from secondary schools produced significantly more words (M =102.88, SD = 38.48) than subjects from primary schools (M = 90.50 SD = 29.15). They also produced significantly different numbers of words in each specific category. In order to clarify the differences between the two groups in each category of words a series of T-tests was used. Results showed that secondary school subjects produced significantly more words in 4 categories: negative self-descriptive adjectives [t (188) = 1.98, p < 0.05], sad feelings [t(187) = 3.54, p < 0.01], sad things [t(190) = 3.59, p < 0.001], and scary things [t(204) = 4.56, p < 0.001). Differences between the two groups on producing words in other categories: semantically related neutral words (animals), semantically unrelated neutral words, positive self-descriptive adjectives, happy feelings , happy things, and scary feelings were not significant (see Figure 4.2) (see results in Appendix 4.2).

Figure 4.2. The distributions of words produced by primary and secondary school students.



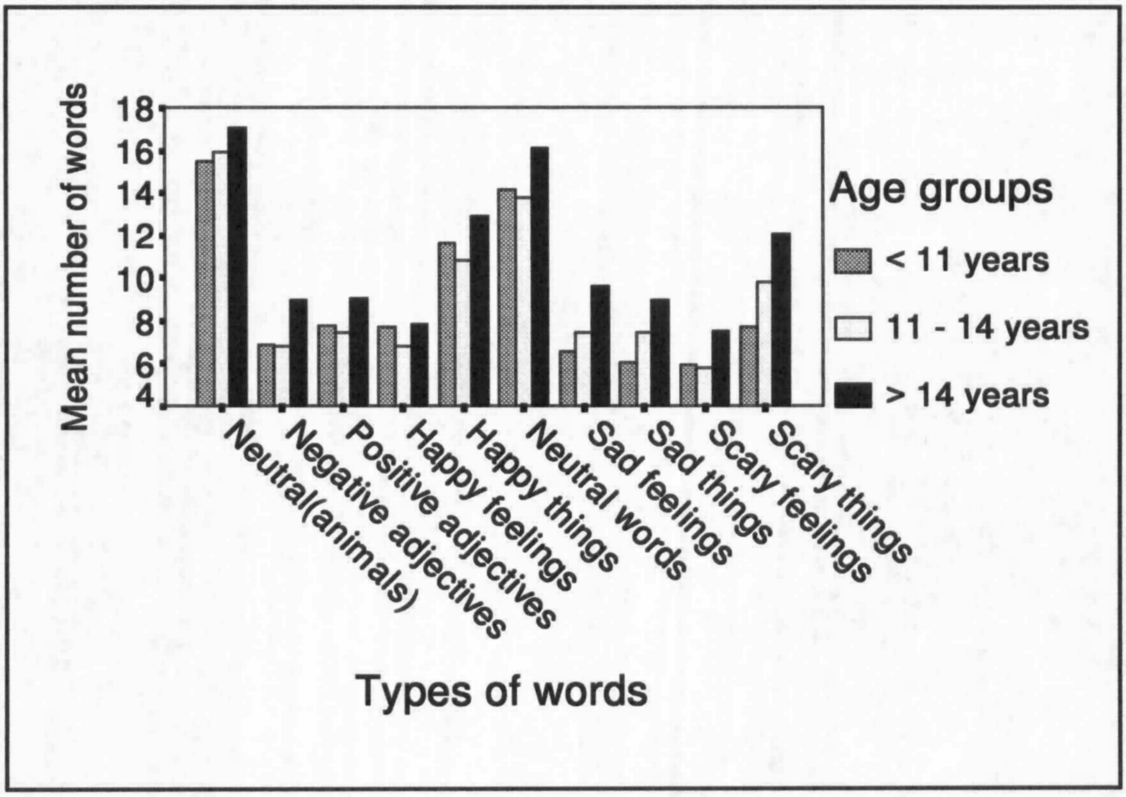
4.3.2. Age Effect

In order to examine in more detail the effect of age on the production of words, subjects were divided into three groups: 11 years old and younger (M = 10.05, SD = 0.62); older than 11 years and younger than 14 (M = 12.67, SD = 0.94), and 14 and older (M = 15.16, SD = 0.90).

In an Age Group (3) x Sex (2) x Word Type (10) analysis of variance with repeated measures on the last factor, the effect of Age Group, [$F(2, 215) = 7.58$, $p < 0.01$]; Sex, [$F(1, 215) = 24.75$, $p < 0.001$]; and Word Type, [$F(9, 1935) = 173.11$, $p < 0.001$] were significant as were the following interactions: Age Group x Sex, [$F(2, 215) = 6.38$, $p < 0.05$]; Age Group x Word Type, [$F(18, 1935) = 2.31$, $p < 0.001$]; Sex x Word Type, [$F(9, 1935) = 6.51$, $p < 0.001$]; Age Group x Sex x Word Type, [$F(18, 1935) = 4.42$, $p < 0.001$].

A one way analysis of variance and post hoc multiple comparisons (Student-Newman-Keuls with $P < 0.05$) were used to clarify these differences between the three groups. Results showed that the three groups were significantly different [$F(2, 220) = 8.02$, $P < 0.001$], with older group produced significantly more words in total ($M = 110.15$, $SD = 41.17$) than the younger group ($M = 89.99$, $DS = 28.97$), and the middle group ($M = 92.20$, $SD = 30.78$) but the difference between the last two groups was not significant. The groups were also significantly different in the number of words produced in 6 categories: negative self-descriptive adjectives [$F(2, 220) = 5.44$, $p < 0.01$]; and sad feelings [$F(2, 220) = 8.99$, $p < 0.001$] in both of which the older group produced significantly more words than the other two groups; sad things [$F(2, 220) = 8.40$, $p < 0.001$], semantically unrelated neutral words [$F(2, 220) = 8.99$, $p < 0.001$], and scary feelings [$F(2, 220) = 2.97$, $p < 0.05$] in which the older group produced significantly more words than the younger group; and, finally, scary things [$F(2, 220) = 14.10$, $p < 0.001$] in which the older group produced significantly more words than the two other groups and the middle group more than the younger group. The number of words produced by the three groups was not significantly different in the 4 remaining categories: semantically related neutral words (animals); positive self-descriptive adjectives; happy feelings; and happy things. The mean numbers of words in the different categories produced by the 3 age groups are shown in Figure 4.3.

Figure 4.3: Mean numbers of words produced by 3 age groups

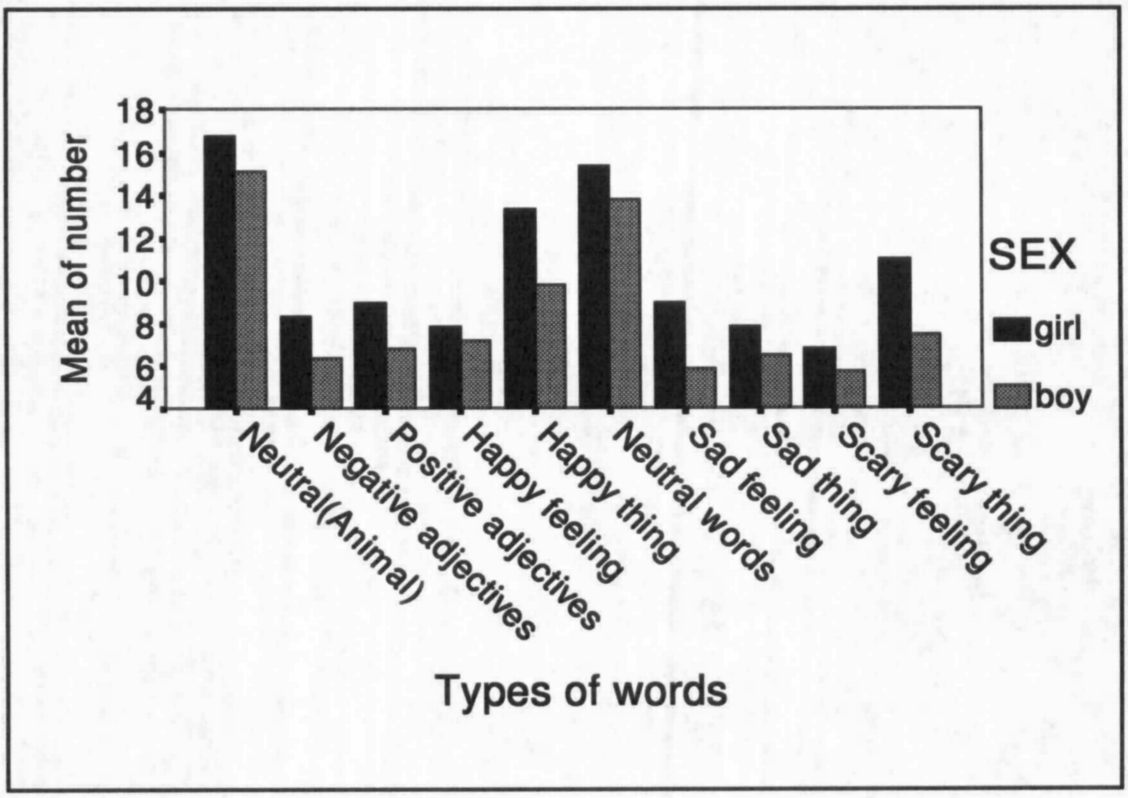


4.3.4. Sex Effect

In total, girls produced significantly more words than boys (M = 105.26, SD = 35.69 for girls & M = 84.64, SD =29.32 for boys). Results of T-tests showed that there was no significant differences between 2 groups on age (M = 12.15, SD = 2.60 for girls & M = 12.34, SD = 2.60 for boys) so it seems that this is a genuine effect of sex.

In order to clarify the differences between boys and girls, more specifically for different categories of words, a series of T-Tests was used. Results showed that girls produced significantly more words in 8 categories of words: semantically related neutral words (animals) [$t(150) = 2.56$, $p < 0.05$]; semantically unrelated neutral words [$t(219) = 2.09$, $P < 0.05$]; negative self-descriptive adjectives [$t(218) = 3.44$, $P < 0.01$]; positive self-descriptive adjectives [$t(219) = 3.98$, $p < 0.001$]; happy things [$t(219) = 5.17$, $p < 0.001$]; sad feelings [$t(215) = 5.39$, $P < 0.001$]; sad things [$t(212) = 2.07$, $P < 0.05$]; scary things [$t(217) = 5.11$, $P < 0.001$]. The differences were not significant in two categories: happy feelings and scary feelings (see Appendix 4.3). The mean numbers of words in different categories produced by girls and boys are shown in Figure 4.4.

Figure 4.4:Mean numbers of words in different categories produced by girls and boys.



In order to examine the effect of sex on word production in primary and secondary school students separately, two repeated measures analyses of variance were carried out.

First, for the primary school students: In a Sex (2) x Word Type (10) analysis of variance with repeated measures on the last factor, the effect of Word Type was significant [$F(9, 963) = 118.73$, $p < 0.001$]. A trend was found for the effect of Sex [$F(1, 107) = 3.60$, $p = 0.06$]; however, the interaction of Sex x Word Type was not significant [$F(9, 963) = 1.05$, ns].

Second, for the secondary school students: In a Sex (2) x Word Type (10) analysis of variance with repeated measures on the last factor, the mean effects of Sex [$F(1, 110) =$

18.50, $p < 0.001$], and Word Type [$F(9, 990) = 88.33$, $p < 0.001$]; as well as the interaction of Sex x Word Type [$F(9, 990) = 10.01$, $p < 0.001$] were significant. These analyses showed that the effect of Sex on word production was only significant for the secondary school students.

In order to clarify the differences between boys and girls on different categories of words in the secondary school students, a series of t-tests was carried out. Results showed that girls produced significantly more words in 5 categories: negative self-descriptive adjectives [$t(110) = 3.44$, $P < 0.01$]; positive self-descriptive adjectives [$t(110) = 3.90$, $P < 0.001$]; happy things [$t(94) = 5.60$, $P < 0.001$]; sad feelings [$t(100) = 7.22$, $P < 0.001$]; scary things [$t(105) = 7.36$, $P < 0.001$]. A trend was found for "semantically related neutral words (animals) [$t(62) = 1.79$, $P < 0.01$]. The mean numbers of words in the different categories produced by girls and boys are shown in Figure 4.4. The summary of findings is presented in Table 4.3.

Table 4.3 The summary of findings

Type of word	School	Age	Sex in the S. Sc.
Neutral (animal)	Ns.	Ns.	G > B T.
Neutral	Ns.	O > Y *	Ns.
Positive adjectives	Ns.	Ns.	G > B **
Negative adjectives	S > P *	O > M *, O > Y *	G > B **
Happy feelings	Ns.	Ns.	Ns.
Happy things	Ns.	Ns.	G > B **
Sad feelings	S > P **	O > M *, O > Y *	G > B **
Sad things	S > P **	O > Y *	Ns.
Scary feelings	Ns.	O > Y *	Ns.
Scary things	S > P **	O > M > Y *	G > B **
Total	S > P *	O > M *, O > Y *	G > B **

* = $p < 0.05$;** = $p < 0.001$; Trend = T.; Not significant = Ns.; School = Sc.: Primary = P; Secondary = S; Age: < 11 years = Y; 11-14 years = M; < 14 = O; Sex: Boy = B; Girl= G

4.4. Discussion

In the present study children were asked to generate emotional and non-emotional words to 10 probe questions. Children were able to respond to the task at the primary school level; however, their ability to produce words improved between primary and secondary school. Children were able to categorise different emotions (feelings) and they also were able to differentiate the feelings from the things which may cause these feelings. The differences between primary and secondary school children in the generation of negative emotional words: sad feelings; sad things; scary things; and negative adjectives were significant, but the differences were not significant on the categories of the positive emotional words: happy things; happy feelings; and positive adjectives. This reveals that the time between primary and secondary school seems important for the expansion and development of a negative emotional word vocabulary but not a positive.

Secondary school girls produced significantly more words than boys. This could be due to a number of factors such as differential effects of education, the girls being more motivated; girls having more compliance with the teacher and experimenters, girls having stronger verbal abilities, or an interaction of one or more of these factors.

The main purpose of the study was to generate a corpus of emotional words used by children for use in experimental investigations. The corpus should then permit more rigorous investigation of cognition and emotion relations in children by allowing the investigator(s) to balance materials for frequency of usage by children rather than by merely applying adult-based frequency tables. Appendix 4.6 show the 25 most frequently generated words by children and adolescents.

4.5. Development of a list of a list of PTSD words

To develop a suitable pool of PTSD words related to traumas, a pre-research questionnaire on all three tasks (Stroop, Recall and Recognition) was undertaken. To do this, 2 different lists of words related to road traffic and personal violence accidents (in total 25 questionnaires) were given to psychologists and psychiatrists. These were all experts in young people's problems (children and adolescents) and were working in the Children's Department of the Maudsley Hospital and the Psychology Department of the

Institute of Psychiatry. They were asked to rate the words, in the order of their severity as follows:

Would you please look over the following list of words. The words are related to Personal Violence Trauma (or Road Traffic Accidents) for young people (Age 10 to 17). Please rate each word in terms of how upsetting you find it.

Please use the following rating scale:

0= Not at all upsetting

1= Mildly upsetting

2= Moderately upsetting

3= Highly upsetting

Please tick the most appropriate box.

Note 1- Do you think the young people (Age 10 to 17) can understand the meaning of the words? If there is any word that they cannot understand, please indicate.

Note 2- If you know any other words related to Personal Violence Trauma, please add at the end of the list.

Thank you very much for your cooperation.

They returned 17 out of 25 questionnaires. Appendix 4.7 shows the results of the rating of the words.

CHAPTER 5

THE PERFORMANCE OF CHILDREN WITH PTSD ON A COLOUR NAMING TASK (THE MODIFIED STROOP PARADIGM)

5.1. Introduction

There are two broad ways to study the relationship between emotion and cognition. One is focused on structured interview and questionnaires; for example, Hibbert (1984) found that panic patients worried about bodily injury while generalised anxiety patients worried about personal inadequacy. A second method uses paradigms from cognitive psychology (Willliams, Watts, MacLeod & Mathews, 1988). These methods are not restricted to conscious cognition and include studies of information processing (see Chapter 3 for a detailed discussion).

In the last decade, much research has investigated cognitive aspects of emotional disorders such as anxiety and depression. Information processing concepts have been suggested as a basic framework for understanding disorders including PTSD (Beck & Emery, 1985; Foa et al., 1989). Long term disorders create cognitive structures (fear structures) which are activated during emotional arousal (Williams, Watts, MacLeod & Mathews, 1988). Patients with anxiety disorders are thought to develop fear structures and presentation of information which is represented in a fear structure is thought to activate it and consequently to evoke fear responses (Lang, 1977). Investigators have used various experimental paradigms such as the Stroop colour naming task, an attentional probe dot and various memory tasks to study how different people process emotional information.

5.2. What is the Stroop task?

The foundation of Stroop's research is evident about 50 years before Stroop. McKeen Cattell (1886) found that subjects can read actual words aloud faster than when they are asked to provide words corresponding to colours. For example saying "red" to a patch of colour was slower than saying "red" to the word red (MacLeod, 1991). Cattell concluded that in the word case, the association between the idea and name has become an automatic process while in the case of naming colours and pictures, the subject must choose the name by a voluntary effort (Cattell, 1886). John Ridley Stroop (1935) chose this idea to investigate as a subject for his doctoral dissertation in experimental psychology.

Stroop (1935) suggested that words and colours in a colour naming task might produce interference which would provide a way to study certain automatic cognitive processes. This task consists of two dimensions: The word and a physical attribute such as colour, form etc. In the standard Stroop (1935) task, the colour of the ink prints the name of a colour. The important variable is the degree of congruence between word and ink colour. In the congruent condition both dimensions match while in the incongruent condition they do not. Subjects should attend to one dimension while ignoring the other one. Reaction time to the task is the main measure to compare these two different groups.

In the Stroop task, subjects are required to respond to one aspect of stimuli which vary in two dimensions, and to ignore the other. In the standard version of the task, subjects are shown words written in different colour inks, as noted above. In the situation of reading the word, subjects are affected by ignoring the colour of the ink. When the task is to name the ink colour, subjects are influenced by the word form. If the word conflicts with the ink colour (e.g., GREEN in red ink), the subjects show a longer latency to respond (i.e., say "red") than for control stimuli (e.g., a row of Xs printed in red ink) and they are also faster if the word agrees with the ink colour (e.g., RED in red ink). Data show that subjects are slower overall at colour naming than at word reading, suggesting that colour naming is a less practiced task. The Stroop effect demonstrates a basic aspect of attention in which people ignore some features of the environment, but not others. The main question is how can this phenomenon be explained? The simplest interpretation for the Stroop effect is that the difference between colour naming and word reading is speed of processing. Subjects are customarily faster at reading words than naming colours. Due to this fact it is possible that the words are processed more rapidly than colour information. Therefore, if the word coincides with the colour, the subject will be facilitated in the colour naming response, in contrast, if the word conflicts with the colour there will be a longer response time or interference for colour-naming, but because colour information arrives at the response stage after the word information, it should have no affect on the word reading process.

This type of account draws on the distinction between automatic and controlled processes (Cattell, 1886; Shiffrin & Schneider, 1977). Automatic processes are fast, do not require attention for their execution and occur compulsorily. In contrast, controlled processes require attention and occur voluntarily. From this point of view, investigators have used the Stroop task for assessing automatic processing. Regarding this MacLeod states:

"The automaticity account, also due to Cattell, emphasizes the much greater practice accrued by word reading relative to ink colour naming. This extensive practice has made reading automatic: it is beyond volitional control and does not require attention. In contrast, ink colour naming is a controlled process requiring attention. An automatic process will interfere with a nonautomatic one, but not vice versa, producing asymmetrical interference" (1994, pp. 358).

More recently, the Stroop task has been modified to include threat, positive and neutral words in place of colour words for use in studies of subjects with emotional disorders (Mathews & MacLeod; 1985). In this paradigm, words related to a specific category such as threat are printed in a single card containing up to 100 words. Computerised Stroop tasks have also been developed (McNally, 1990) to study information processing in subjects who suffer from emotional disorders such as PTSD, panic and OCD. The computerised version allows presentation of the words singly and randomly, while in the card version each word group is usually presented on the same page, therefore there is likely to be a contamination from the cumulative effect of words upon attention or emotional reaction in the card versions. Interference happens because, despite the subject's effort to focus on the colour in which the word is printed, the emotional significance of the word captures the attention of the subjects and produces delays in colour naming, in contrast to the words that are not emotionally significant for the subject. The Stroop colour naming task is considered to be a useful measure of attention (MacLeod, 1991). In the next part I review the empirical findings using the modified Stroop paradigm with emotional disorders.

5.3. Stroop Interference in Adults with Anxiety Disorders

The modified Stroop paradigm has been widely used by investigators to test attentional bias in anxiety disorders. The results have demonstrated increased response latencies to fear-relevant information. These effects are found in generalised anxiety disorder (GAD) (e.g. Mathews & MacLeod, 1986) simple phobia (e.g. Watts et al.,1986), panic disorder (Ehlers et al., 1988; McNally et al., 1994), social phobia (Hope et al., in press), OCD (McCarthy et al., 1990) and PTSD (e.g. Kaspi & McNally, 1991; Cassiday et al., 1992; Thrasher et al., 1994).

5.3.1. The Stroop effect in subjects with generalised anxiety disorder

Mathews and MacLeod (1985) in a study with GADs and controls used a card version of the modified Stroop task. The stimuli included 12 physical threat, 12 social threat, 12 positive and 12 neutral words. Each set of 12 words was written a total of 8 times on a large card. The results indicated that anxious patients were significantly slower at colour naming all types of words, especially social threat words. Interestingly, the anxious patients were faster at colour naming physical threat-related stimuli than control words. The authors concluded that state anxiety is the most important factor influencing emotional Stroop interference. In this study, non-threat words were of mixed positive and neutral valency (i.e. some were emotion related) and were not semantically related to each other. This group of words was not matched for length and frequency with the two other groups i.e. physical threat and social threat. Thus, any effects could be due to differential processing of groups of semantically related words.

Mogg et al. (1990) replicated the study of Mathews and MacLeod (1985). They found that the patients showed very clear interference in the Stroop task compared with the control group and correlational analysis indicated trait anxiety to be a greater predicter of the interference measure compared with state anxiety.

Richards and Millwood (1989) used a computerised Stroop task with anxious subjects, with three groups of words (positive, neutral, and threat-related). The words were presented on the screen of the computer one at a time and the subject reacted to the stimuli by pressing a button. Anxious subjects showed significant interference when reading the threat words relative to controls, while the patients were faster for positive words than negative words. This study was the first computerised Stroop study with anxious patients and it is possible that the difference in the findings from the card version is due to the different pattern of presentation (Dalgleish, 1994).

Mogg and Marden (1990) tried to address four questions in their Stroop study: 1) are processing biases for threat stimuli a specific feature of clinical anxiety states? 2) is the anxiety-related processing bias specific to threat-related information? 3) are such biases also apparent for information which is relevant to personal concerns, even if those concerns are unrelated to threat? and 4) can processing biases be explained in terms of word familiarity effects? Four groups of subjects (12 per group), high trait anxious, low trait anxious, rowers (students who were active rowing club members for at least one year) and non-rowers were selected. The performance of the groups was compared on a modified Stroop colour-naming task which consisted of six sets of words including, physical threat, social threat, positive, neutral, high frequency, and rowing words. The results appeared to suggest that anxious subjects selectively processed emotional information in general, rather than threat words in particular.

In another study Mogg et al. (1990) used subjects with high and low trait anxiety to investigate the relationship between state- and trait-anxiety and scores on the emotional Stroop task. They found that high trait anxious subjects relative to controls were slower at colour naming threat words. In addition, the results suggested that the subjects in a high-stress condition showed a significant Stroop interference effect compared to subjects in a low-stress condition. Analyses of these results indicated that both high trait anxiety and high stress are related to emotional Stroop performance.

Mogg et al. (1993) used subliminal and supraliminal versions of the colour naming task with five categories of stimuli with three groups of subjects including anxious, depressed and normal controls. There were two types of negative words (anxiety-relevant and depression-relevant) and neutral, positive and uncategorised neutral words. All five sets of words were matched for length and frequency and the emotional words were matched on ratings of emotionality by judges. The results showed that anxious subjects, compared with depressed and normal subjects were relatively slow in colour naming negative words that were subliminally presented. That is, there was a preattentive bias for negative information. In addition the results indicated no evidence of any processing bias for positive information in anxious and depressed subjects. These results contrast with previous research using the card version of the Stroop task showing that anxious individuals are slower in colour naming both threat-related and positive words compared with controls (Martin et al. 1991; Mogg & Marden, 1990). Finally the results indicated that the selective interference effect in colour naming performance was found for negative information in general and not just threat-related information.

MacLeod and Hagan (1992) investigated the emotional Stroop effect using a computerised task. The stimulus words used in the Stroop task were taken from Mathews and MacLeod (1985) and comprised threat-related words and neutral words. Two presentation conditions were used: masked, in which the words were presented for 20 msec and then replaced by a pattern mask in the same colour; and unmasked, in which the words remained on the screen until the subject responded. A two month follow-up was carried out with the same subjects. The results showed that anxiety, as measured by the questionnaires, was associated with a selective slowing on the threat-related words in the masked exposure condition in the Stroop task. There was no evidence that anxiety was associated with greater Stroop interference in the unmasked condition.

Dalgleish (1994, expts 1& 2) compared two sets of Stroop tasks (computer and card presentation formats) with threat-related, positive, semantically-related neutral, semantically unrelated neutral, and bird-related words (i.e., the names of common birds). The groups of subjects used were normals with trait anxiety scores of 50 or more, normals with trait anxiety scores of less than 40 and ornithologists to control for expertise. The ornithologist group was only included in the computer-presentation condition. The results indicated that the high-trait anxious subjects showed increased colour naming times for threat-related and positive words relative to semantically-related neutral words in the card presentation format. In addition, there was an emotional Stroop effect with threat-related stimuli in the low-anxious subjects. In contrast, the computer-presentation format showed a significant emotional Stroop effect with threat-related words in the anxious group but not in the control group and there were no emotional Stroop effects associated with positive stimuli in either group. Regarding expertise, there was a highly significant effect, with ornithologist subjects showing retardation on their times to colour-name bird words (relative to semantically-related neutral words) and the other subject groups showing no differenece. The results from both presentations supported previous findings of emotional interference in subjects with anxiety problems.

In summary, the research using the modified Stroop paradigm with clinical and nonclinical anxious individuals showed equivocal findings. The results of most of them indicated that the subjects demonstrated longer response times with negative words than with neutral words. Research using the card presentation format revealed a general effect of emotionality as similar patterns of findings are found with positive words as well. However, findings from the two types of studies with the card and computerised Stroop formats with anxious individuals suggest that the anxious subjects exhibit an attentional bias for threat-related stimuli comparing with the control subjects and compared with neutral words.

5.3.2. The Stroop effect in adult subjects with other anxiety disorders (except PTSD)

There is a body of studies which has examined the emotional Stroop effect in other anxiety disorders. These studies variously used the computer or card presentation formats. Watts et al. (1986) carried out three experiments to examine emotional Stroop task performance with phobic patients. In the first experiment, 35 spider phobics were presented with 4 sets of words including colour words, threat words, spider-related words and control words. Spider phobics demonstrated significantly longer response times to spider-related words than to neutral words. In the second experiment, spider phobics from the first experiment were randomly assigned to treatment. Following four sessions of treatment, the subjects had significantly reduced their response times to spider-related words. Differences between posttreatment spider phobics and control subjects were not significant. In the third experiment, 40 new spider phobics were administered two equivalent forms of the spider Stroop. The only word common to both forms was spider. Results revealed significantly longer response times to spider-related words in both groups which showed the reliability of the two equivalent forms.

DiBenedetto and Evans (1989) studied subjects with Obsessive Compulsive Disorder (OCD) characterised by fear of contamination, and non-anxious medical patients. Six sets of word cards including contamination, checking, general threat, and neutral colour words were used in this study. OCD subjects showed significantly longer response times to colour name words related to contamination than for checking, general threat, or neutral words. The data suggested a specific attentional bias for feared stimuli in OCD subjects.

Hope et al. (1990) compared subjects with social phobia and panic disorder. Stimuli included social threat words, physical threat words, colour names, groups of Xs, and neutral control words. Social phobics, but not panic subjects, demonstrated significantly longer response times for social threat words than for all other stimuli. Panic subjects demonstrated significantly longer response times for physical threat words than for all other stimuli. Thus, the groups exhibited attentional biases for threat cues that are specific to their individual fears.

McNally et al. (1990) used a computerised Stroop paradigm to investigate selective processing of threat cues in patients with panic disorder. Panic patients exhibited more Stroop interference when colour naming fear words, bodily sensation words, and catastrophe words.

Taken together, research using the emotional Stroop paradigm with individuals suffering from anxiety disorders other than GAD or PTSD has generally revealed increased Stroop interference associated with words related to the disorder. Research with disorders such as phobias suggests that this is not only a function of the individual's familiarity with the material but is somehow related to its emotive content.

5.4. Emotional Stroop Effects in Depressed Adults

Modified Stroop tasks have been used to assess information processing in depression. In most of these studies, target words were negative words related to depression and were compared with neutral or positive words, using both clinical and non-clinical depressed subjects.

Gotlib and Cane (1987) compared the performance of 15 undergraduate students with low scores on the Beck Depression Inventory (BDI, Beck et al., 1961) with 15 undergraduate students with high scores on the BDI on a modified Stroop Task. The stimuli included three types of words: 50 self descriptive "depressed" adjectives, 50 self descriptive "manic" adjectives, and 50 neutral words. The words were presented in random order via a tachistoscope. The findings indicated a longer mean response latency for depressed subjects to name the colour of depressed words relative to manic words, while there were no differences in the non-depressed subjects (i.e. subjects with low scores on the BDI). These findings were supported by Kileger and Cordner (1989).

Gotlib and Cane (1987) compared the performance of 35 depressed inpatients and 14 non-depressed controls before discharge and a week following discharge with the same words used by Gotlib and MacCann (1984) on the Stroop task. Depressed subjects demonstrated longer response latencies to the depressed words than the other cues before discharge which replicated the Gotlib and MacCann (1984) finding.

Gotlib and McCann (1984) also in two studies tried to examine the nature of negative schemata in depressed subjects. In the first study they assessed the relative accessibility of positive and negative constructs in depressed and non-depressed university students, and in the second one they attempted to replicate the findings of the initial investigation through a mood induction paradigm. In the first study 30 subjects were selected on the basis of their scores on the BDI. The subjects were asked to name the colour of three categories of words (depressed, manic and neutral). The results showed that depressed subjects produced longer colour-naming response latencies to depressed words than to neutral or manic words. In contrast, non-depressed students did not demonstrate differential reaction times to the three types of words. In the second study, they compared the performance of 30 undergraduate students who were randomly divided into three experimental conditions, depression, elation, and neutral mood on a mood-induction paradigm. The results suggested that, in spite of differences on the Mood Adjective Checklist for the depressed group, there were no significant effects on this task. They concluded that transient mood is not a sufficient explanation for the results obtained in the first experiment.

Williams and Nulty (1986) in a study of 42 women who had volunteered for a project on "worrying" half of whom were previously under treatment for anxiety were divided into high and low depressed groups. They participated in a modified card Stroop task. The results revealed a tendency for the high depressed group to show a larger difference between the time taken to name the control words and emotional words, but this effect was more clearly marked when subjects were assigned to groups on the basis of depression levels ascertained 12 months previously. A question remains as to whether this effect may be related to levels of anxiety. The results suggest that under some circumstances the emotional Stroop may be assessing residual effects of previous depression. These results supported previous findings of Williams and Broadbent (1986) of significantly longer reaction times in the colour naming task for depression-related words for a group which had attempted suicide.

It seems that self descriptive depressed adjective stimuli can produce longer latencies on a colour-naming task in depressed subjects than other types of stimuli. Segal et. al (1988) compared the performance of 14 subjects with unipolar depression, 9 anxiety and 14 normal controls on a card version of the modified Stroop task. Each experimental trial

consisted of the presentation of a prime word (personal adjectives words which had been rated previously as either extremely self-descriptive or neutral) followed by a target word that was printed in colour. The subjects were asked to name the colour of the target words and then recall the prime words. Results indicated a significant interference effect when the prime and the target were both self-descriptive adjectives than when only the target was self-descriptive and the prime was not. For self-descriptive adjectives alone, this effect was significant for the depressed group. The authors concluded that these findings support the notion of a cognitive schema about the self.
Carter, Madock, and Magliozzi (1992) compared the performance of 24 subjects with panic disorder (agoraphobia), 30 with major depression, and 25 normal controls with four types of words: neutral, physical threat, anxious-related, and depressed-related words. The results showed that panic subjects exhibited a significant interference towards both threat and depressed words, while the depressed group showed a trend only towards depressed-related words.

Kinderman (1994) compared the performance of patients with persecutory delusions, non-psychotic depressed, and control subjects on a modified Stroop Task. They used four separate cards: strings of Os, personally descriptive positive adjectives, personally descriptive negative adjectives and neutral words. The results revealed that the depressed group demonstrated a significant interference with colour-naming of negative words comparing to neutral words, while the persecutory delusions group demonstrated greater levels of interference for both negative and positive words.

In summary, findings from studies using the Stroop task with depressed subjects are less consistent than findings with anxious patients, although some of them suggest a tendency to find emotional Stroop effects toward depressed cues, particularly for self-descriptive stimuli. This may be due to the level of anxiety which is present in depressed subjects. Taken together, these findings may be taken as providing some support for Williams et al.'s (1988) model (see Chapter 3) that suggests that, in depression, processing resources are not automatically drawn toward negative information, while in anxiety, processing of threat-related information are automatic and this bias does not depend on conscious awareness of the stimuli.

5.5. Stroop Interference in Adults with PTSD

Limitations of traditional methods such as self-report questionnaires or structured interviews have inspired researchers increasingly to apply experimental methods such as information-processing to study cognitive dysfunctions in disorders such as PTSD. Investigators have carried out two types of information processing studies with subjects with PTSD (McNally, 1995). First *"valence-independent"* studies demand that individuals process information that varies in complexity, but not in emotional valence such as studies on intelligence, short term memory and so on (for more details see Chapter 8). Second *"valence dependent"* studies demand that subjects process information related to the trauma such as attentional and memory biases using Stroop or attentional deployment paradigms to assess attention, and recall and recognition tasks to assess memory. This section attempts to review studies using the Stroop paradigm with individuals who suffer from PTSD.

This paradigm has been used to test information processing and the effect of intrusive thoughts on attention in PTSD with adults subjects (Kaspi & McNally, 1991; Cassiday et al., 1992; McNally et al., 1992, 1993; Foa et al., 1991; Thrasher et al., 1994).

Foa et al. (1991) investigated selective processing of threat words with PTSD. In this study 15 rape victims with PTSD, 13 rape victims without PTSD and 16 nontraumatised control subjects were presented with four types of word: specific threat (rape-related) words, general threat (related to physical harm and death) words, neutral words and non-words. The results indicated that rape victims with PTSD took longer to respond on colour naming to rape related words than other groups of words. Non-PTSD victims and non-victim controls did not show significant differences across word types. These results suggested that the Stroop interference to rape-related words is associated with PTSD rather than simply with prior exposure to rape. The two groups of victims did not differ with respect to extent of injury during the rape or life threat. Therefore, whereas both PTSD and no-PTSD groups reported similar rape experiences, only the PTSD victims showed Stroop effects to rape-related words.

Cassiday et al. (1992) used a computerised Stroop Paradigm to investigate attentional bias in rape victims with PTSD. The PTSD group comprised 11 women and 1 man; the non-PTSD group comprised 12 women who had been raped but did not meet PTSD criteria; the non-traumatised control group comprised 11 women and 1 man who had never been sexually assaulted. They used four types of stimuli: high-threat words, moderate-threat words, positive words and neutral words. They found that PTSD subjects exhibited greater Stroop interference for high-threat words than for other words, and exhibited greater interference for these words than did non-traumatised and normal subjects. Their findings are generally consistent with those of Foa et al. (1991) who found that rape victims with PTSD exhibited interference for rape-related words. Interference for high-threat words was significantly correlated with scores on the intrusion subscale of the Impact of Event Scale, but not with the avoidance subscale. They concluded that these data support the idea that the Stroop paradigm may provide a non-introspective method of assessing negative intrusive cognitions.

Cassiday et al. also found that PTSD subjects exhibited greater interference for positive words than neutral words. This finding is consistent with Martin et al.'s (1991) emotionality hypothesis. This may indicate that anxiety-disordered individuals do, indeed, selectively process any emotional information, not merely that associated with threat. Although, in a body of studies using the modified Stroop paradigm anxious subjects did not show a significant interference towards positive stimuli (e.g. Mogg et al., 1990).

Thrasher, Dalgleish & Yule, (1994) investigated three groups of subjects: high PTSD, low PTSD and non-traumatised controls. All the subjects were survivors of the Herald of Free Enterprise ferry sinking. There were five types of card-presented word: ferry disaster words; general threat words; neutral, semantically-unrelated words; neutral semantically-related words; and positive words. The group with high levels of PTSD evidenced significantly longer response latencies for colour naming disaster related words than for other word types. The results of the low-PTSD survivors and the non-traumatised controls showed no significant differences between response latencies for general threat words compared to neutral words.

A similar study was carried out by McNally et al. (1990) used a computerised Stroop task. They presented four categories of words: semantically-unrelated neutral words, positive words, obsessive-compulsive words (e.g. GERMS) and PTSD words to Vietnam veterans with PTSD and without PTSD. The PTSD subjects indicated significantly longer latencies to colour name the PTSD words rather than the other types of the words, but the Vietnam veterans without PTSD did not.

McNally et al. (1993) recruited 24 Vietnam combat veterans who met PTSD criteria. The subjects were asked to name the colours, from left to the right, in which the words were printed. In the results, it appeared that PTSD patients exhibited interference for words related to trauma, but did not exhibit such interference for neutral words, or words relevant to another anxiety disorder. These findings closely replicate those of McNally et al. (1990) who found that PTSD patients exhibited Stroop interference for trauma-related words, but not for neutral words.

Kaspi et al. (1995) carried out a study using a computerised Stroop colour-naming task with Vietnam combat veterans either with or without PTSD. The subjects were asked to name the colour of neutral, positive, negative, and combat words. Words appeared either randomly or blocked by type. Results showed that PTSD patients exhibited more interference for combat words than for other words, whereas control subjects exhibited similar, but less pronounced, patterns of interference. Positive words produced no more interference than neutral words, and much less than combat words.

In summary, research using the colour naming task with individuals who suffer from PTSD has found generally increased Stroop effects in word related to the trauma. Dalgleish concluded that "research with subjects with PTSD suggests that this is not merely a function of the individuals familiarity with the material but is somehow related to its emotive content" (1994, p. 31). The data suggest that the Stroop paradigm may provide a non-introspective method of assessing negative intrusive cognitions. Most of these findings are consistent with those of other studies that suggest that anxious patients selectively attend to threat cues (Ehlers, Margraf, Davies, & Roth, 1988; Hope et al., 1990; Mogg, Mathews, & Weinman, 1989; Wars et al., 1986).

5.6. Stroop Interference in Children

Only very few studies have investigated emotional bias in cognitive processing of stimulus words in children, (Martin & Jones, 1992; Schneider et al., 1992; Motta et al., 1994). The last two experiments which investigate the performance of children of adults with PTSD on colour-naming are discussed in the second part of this chapter.

Martin, Horder, and Jones (1992) examined the cognitive performance of children of different ages on both the standard Stroop and a modified spider Stroop task. They recruited 48 children with equal numbers of young (aged 6 or 7 years), middle (aged 9 or 10 years), and old children (aged 12 or 13 years). Within each age group, equal numbers of subjects were allocated to Phobic and Nonphobic groups on the basis of their responses to questioning as to, first, whether they liked spiders and, second, whether they would pick up spiders. A series of potential subjects was screened until the phobic groups (two negative responses from each subject) and the Nonphobic groups (two positive responses from each subject) were filled. Five sets of words were used in this study: nonwords, colour words, control words, spider words, and practice words. Each subject was tested individually, and was instructed to name aloud as fast as possible the colour of the ink in which each word or nonword was written, while ignoring the meaning of the words. They found that biased cognitive processing associated with spider phobia was observed in children as young as 6 or 7 years old. Whereas both phobic and nonphobic children displayed a standard Stroop effect (ink naming being significantly slower for colour words than for nonwords), only phobic children displayed a spider Stroop effect (ink naming significantly slower for spider words than for control words). Another major finding was that the magnitude of the observed cognitive bias, i.e. the contrast between Standard Stroop performance for phobic and nonphobic children, did not change significantly over the entire range of ages studied. These results suggest that cognitive bias may change little with lapse of time since phobia acquisition.

5.7 Puropse of research

The main aim of the present research was to investigate attentional bias using the Stroop colour-naming paradigm in three groups of young people: (1) children and adolescents with PTSD due to road traffic accidents or personal violence; (2) non-symptomatic children of adults (parents) patients who suffer from PTSD (the children were not involved in the accident or trauma); and (3) normal control subjects.

The stimuli for this research were chosen from the corpus of emotionally laden words, including a subset related to traumatic experiences and several subsets related to threat, positive, sad, and neutral words described in Chapter 4.

5.8. EXPERIMENT (1)
INVESTIGATION OF STROOP PERFORMANCE IN CHILDREN WITH PTSD

5.8.1. Hypothesis

Children who suffer from PTSD will show significantly greater interference in colour-naming (Stroop paradigm) negative words particularly trauma-related words, compared with neutral words and with normal-control subjects.

5.8.2. Design

Reaction times of subjects to five different categories of words were subjected to a repeated measures analysis of variance (ANOVA) that included one fixed between-group factor (Group: PTSD patients vs. normal control subjects) and one fixed within-group factor (5 categories of words: neutral, threat-related, depression-related, happy, and trauma-related). For further analysis, another repeated measures ANOVA was conducted with 2 Groups (road traffic accident vs. Personal violence) X 5 Word Types to investigate event effects.

5.8.3. Method

5.8.3.1. Subjects

Twenty three children and adolescents aged 9 to 17 who met Diagnostic and Statistical Manual of Mental Disorders (3rd Edition-Revised, DSM III-R; American Psychiatric Association, 1987) and International Classification Diseases (World Health Organisation, ICD-10, 1992) criteria for PTSD who were matched on age, sex, verbal IQ and reading ability with a group of children and adolescents without any psychiatric problems, took part in this study. All PTSD subjects were involved in Road Traffic or Personal Violence events. Most of the child patients were recruited from the children's department of the Maudsley Hospital, where they had been seen by Prof. W. Yule and a few subjects were identified also from other clinics in London or out of London. Of the 23 PTSD subjects, 11 were boys and 12 girls with a mean age of 154.83 months (SD 35.06). The control group was recruited from several primary and secondary schools from different parts of London. Of the 23 normal subjects, 10 were boys and 13 girls with a mean age of 162.61 months (SD 22.60).

Colour-blind subjects, identified by the Colour-Blindness Test (Ishihara, 1951) and those who had low scores on either Basic Reading (below 85) or British Picture Vocabulary (below 80) tests were excluded (see below).

5.8.3.2. Materials

5.8.3.2.1. Instrumentation

Following some pilot studies, a computerised version of the Stroop task including 120 stimuli was developed (the programme was written by L. N. Law at the Institute of Psychiatry). It consisted of 12 words in each group of words and used four different colours. Each word was presented twice with two colours from four colours randomly. The presentation time was 1.5 seconds. After 40 trials the computer automatically gave a rest to the subject. The time delay after each word was two seconds. The tests were conducted using an IBM- PC 486 portable computer with a colour LCD screen.

(1) Voice Key: A sensitive voice key was used to register the vocal response of the subjects automatically. The voice key connected to a microphone head set worn by the subject. The sensitivity of the voice key could be increased or decreased by means of a control.

(2) Key buttons: The key buttons consisted of five buttons, one button for each colour (red, green, blue, and yellow) and the final button for changing the word on the screen when it does not disappear automatically (because of some problems such as when the computer did not detect the voice of the subject etc.) after the subject's word response and after pushing the button related to each colour.

5.8.3.2.2. Stroop words

Five different categories of words including: (a) threatening words, (b) depression-related words, (c) PTSD words related to trauma, (d) positive words, and (e) categorised neutral words were used. All of the words were selected from the The Dictionary of Emotional Words for Children and Adolescents which was developed in a separate study (see Chapter 4). The groups of words were matched on length and frequency. Each word was presented three times in four different colours (i.e. red, yellow, blue, and green) randomly. In total 120 trials in three sets (each set included 40 trails) were presented to each subject. After each set there was a short rest. Words used in the Stroop task are shown in Appendix 5.1.

5.8.3.2.3. Psychological Measures

1- ***Revised Impact of Event Scale*** (IES, Horowitz et al., 1979): This has 15 items and comprises two sub-scales, one of which measures the extent to which unwanted thoughts and memories of the traumatic event intrude into consciousness and one which assesses the degree to which thoughts and situations associated with the event are avoided. The sum of the two subscales yields a total impact of event score. Items are scored on a 1-5 scale with scores ranging from 0-75. High reliability and sensitivity were reported for the instrument. Results indicated a test-retest relibility of 0.87 for the total scores, 0.89 for the intrusion sub-scale, and 0.79 for the avoidance sub-scale, and about 80% sensitivity.

In a study of children aged 8 to 16 (Yule & Williams, 1990) it was found that children who had survived a sea disaster are reported scores as high as those of traumatised adults.

2- ***Revised Children's Manifest Anxiety Scale*** (RCMAS; Reynolds & Richmond, 1978): This scale has been widely used in studies of children from 8 to 16 years. It is a 37 item questionnaire designed to assess the presence or absence of various symptoms of chronic, trait anxiety. The respondent indicates "YES" or "NO" to statements. Nine lie-scale items assess the validity of the subject's responses. All "yes" responses, except lie-scale items, are scored in the positive direction for anxiety and are summed to produce a total anxiety score. Three main factors are obtained physiological, worry/over sensitivity, and concentration anxiety. It has been found to have high reliability and validity. Results reveal about 0.83 for reliability, and 0.85 for validity.

3- ***Depression Self-Rating Scale*** (DSRS, Birleson, 1981): This instrument is easy to use and suitable for children and adolescents over 8 years. It consists of 18 items. Birleson et. al provide evidence for the scale's utility in identifying depressed children while excluding most non-depressed children. Each item comprises a statment and the child is asked to indicate whether this applies to him/her "most of the time", "sometimes" or "never". "Sometimes" scores one, "most" or "never" score nought or two, depending on the positive or negative polarity of the item. On the DSRS a split-half reliability of 0.82 was obtained (Fundudis et al., 1991) which is consistent with the 0.86 reported by Birleson (1981). It has been widely used in studies of PTSD in children.

4- ***British Picture Vocabulary Scale*** (BPVS short form, Dunn et al., 1981): This scale is designed to measure a subject's receptive vocabulary for standard English. It shows the extent of English vocabulary acquisition. This scale provides an estimate of one major aspect of verbal ability for subjects who have grown up in a standard English speaking environment. It is not a comprehensive test of general intelligence vocabulary.

5- ***Wechsler Objective Reading Dimensions*** (WORD, Basic Reading, Rust et al., 1993). There are three separate components of WORD, each of which makes a distinctive contribution to the assessment of literacy skills. The Basic Reading subtest was used in this study. Basic Reading is concerned with two aspects of the reading process; decoding skills (phonetic analysis and word analysis) and word recognition. A sequence of increasingly difficult items was specified, progressing from items with pictorial prompts to groups of words of increasing complexity. All words in the Basic Reading subtest were selected from various graded word lists and were then systematically selected to include a wide variety of word types (e.g. basic sight words and words with common affixes and to include a variety of vowel-consonant combinations (e.g. blends and digraphs).

5.8.3.3. Procedure

The test was started by the experimenter who activated the computer presentations of the instruction and explanations about the test and what the subject should do during the test. The test was carried out individually, and the subject was asked to sit in front of the computer in a silent room, without any disruptions. The distance of the computer from the subject was about 50 centimetres. The screen measured approximately 24 cm by 18 cm with a visual angle of subject to word stimulus of less than 2 degrees. The font of the words was 24. The subject was asked to read the instructions carefully and asked if he or she had any questions about the test. Finally, by pressing a key the instructions started to appear on the screen. The instructions for the Stroop task were as follows:

In this task you will see some words on the computer screen written in different colours
(blue, red, green, yellow) like this:

Apple
Melon
Pear
Cherry

What you have to do is ignore the word and say out loud the colour into the microphone as quickly as possible.

Let's just check that the computer can hear you.
O.K. any questions?

Now we'll do some practice words. Before each word there will be a large cross on the screen so you know where to look.

After each word there will be a pattern.
O.K.

Remember to ignore the words and to say the colours out loud as quickly as possible.

The presentation of each word on the screen was 1.5 seconds. This was sufficient time for the subject to understand and relate to the meaning of the words. If a subject's response was an error, by pressing the space bar the experimenter omitted the response from the data analysis. Finally, if the subject's voice did not activate the voice key, then the previous word did not disappear. In this situation the experimenter changed the word on the screen via a button press.

After ensuring that the procedures of the test were clear to the subject, the original test started. The task took about 15- 20 minutes in total. All the psychological measures were carried out after the Stroop task.

5.8.4. Results

5.8.4.1. Subject characteristics

Means and standard deviations were calculated separately on various measures of psychopathology for the patient and control groups (see Table 5.1). One way ANOVAS showed that there were no significant differences between the groups for age, verbal IQ, or reading ability (Appendix 5.2), but the clinical group scored significantly higher on the measures of depression [F(1, 44) = 11.62, P < 0.001], and anxiety [F(1, 44) = 6.98, P = 0.011]. PTSD patients' scores on the Impact of Event Scale are comparable with Yule et al.'s studies of child survivors of shipping disasters (e.g.Yule et al.,1992).

Table 5.1 Means and standard deviations (SD) of psychological measures for PTSD subjects and controls

	PTSD		NORMAL		
	MEAN	SD	MEAN	SD	
SEX (M: F)	11: 12	-	10: 13	-	n.s.
AGE (months)	154.83	35.06	162.83	22.72	n.s.
WORD	101.52	12.01	98.43	15.64	n.s.
BPVS	98.43	15.34	95.39	17.27	n.s.
DSRS	13.52	7.35	8.48	4.53	**
RCMAS	14.57	8.25	9.78	5.12	*
IES	33.55	19.46	-	-	

IES = Revised Impact of Event Scale, RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary Scale, WORD (Basic Reading) = Wechsler Objective Reading Dimensions * = P <.01 & ** = P < 0.001

5.8.4.2. Colour-Naming Reaction Times

Means and standard deviations for colour-naming latencies were calculated separately for each group and each word type i.e. threat words (TW); sad words (SW); happy words

(HW); neutral words (AW), and trauma-related words (PW). These data are shown in Table 5.2 and Figure 5.1.

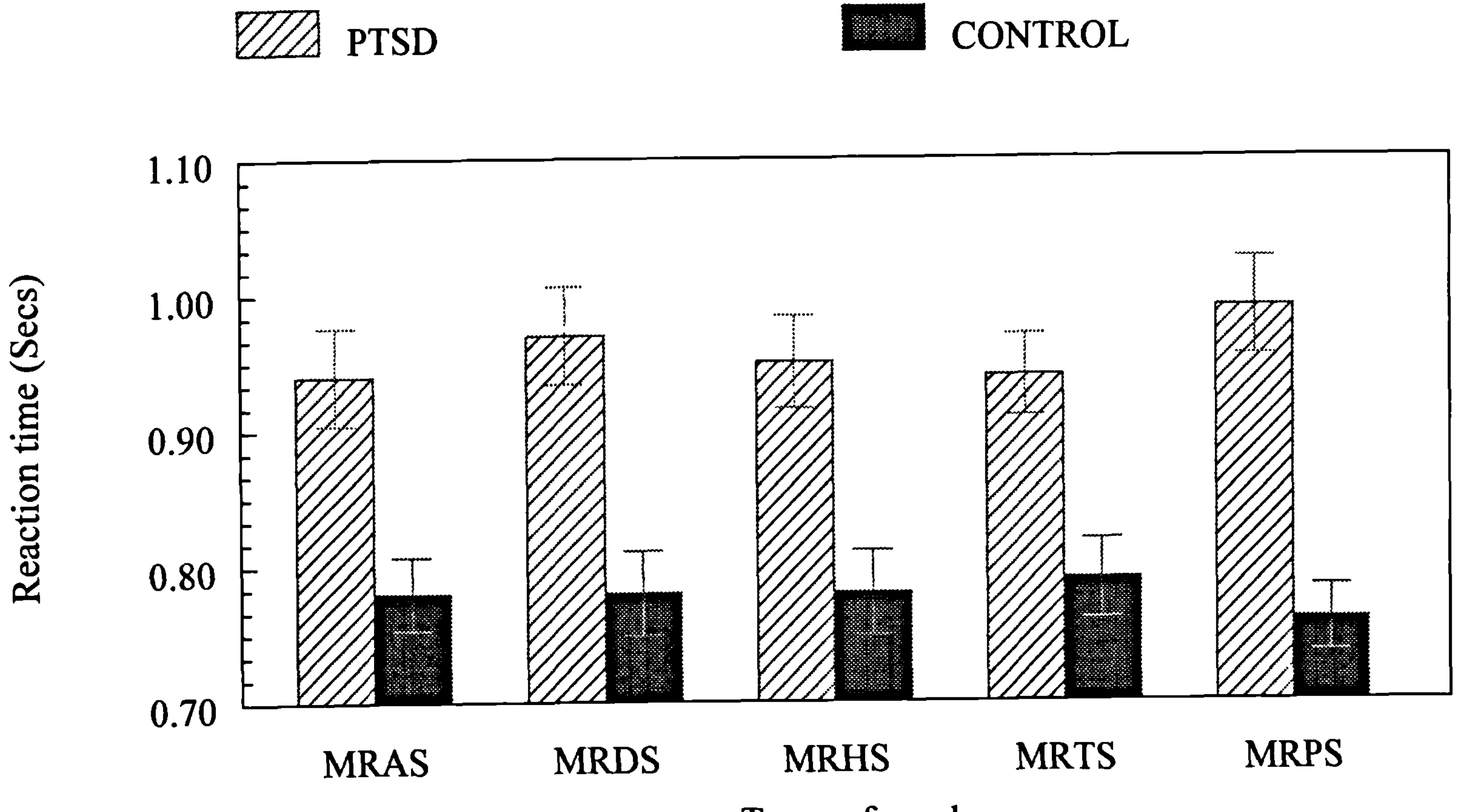
Table 5.2 Means and standard deviations (SD) of colour naming response latencies (sec.) for neutral (animal), happy, threat, depressed and trauma (PTSD) words across two groups (i.e. PTSD and normal controls).

		WORD TYPE				
		NEUTRAL	HAPPY	THREAT	SAD	TRAUMA
PTSD	MEAN	0.94	0.95	0.94	0.97	0.99
	SD	0.17	0.16	0.15	0.17	0.17
NORMAL	MEAN	0.77	0.77	0.79	0.78	0.76
	SD	0.13	0.15	0.14	0.15	0.11

Mean response latencies were submitted to a two-way, Group (2) X Word Type (5) mixed model ANOVA. The results showed a significant main effect of Group [$F(1, 44) < 17.15$, $P = 0.001$]. The PTSD group being much slower than the normal control group. There was also a significant interaction [$F(4, 176) = 4.40$, $P = 0.002$]. The results indicated no Word Type effect [$F(4, 176) = 1.04$, $P = 0.386$].

To examine the interaction, two ANOVAs were performed across each group separately on the mean reaction times of the colour naming task for the five categories of word. The results indicated a significant difference across words in PTSD patients [$F(4, 88) = 3.24$, $P = 0.016$], while there was no difference across the words in the control group [$F(4, 88) = 1.75$, $P = 0.146$].

Figure 5.1. Mean reaction times on the Stroop colour-naming task



MRAS=mean RT on the animal words, MRDS=mean RT on the depressed words, MRHS=mean RT on the happy words, MRTS=mean Rt on the trauma words, MRTS=mean RT on the threat words

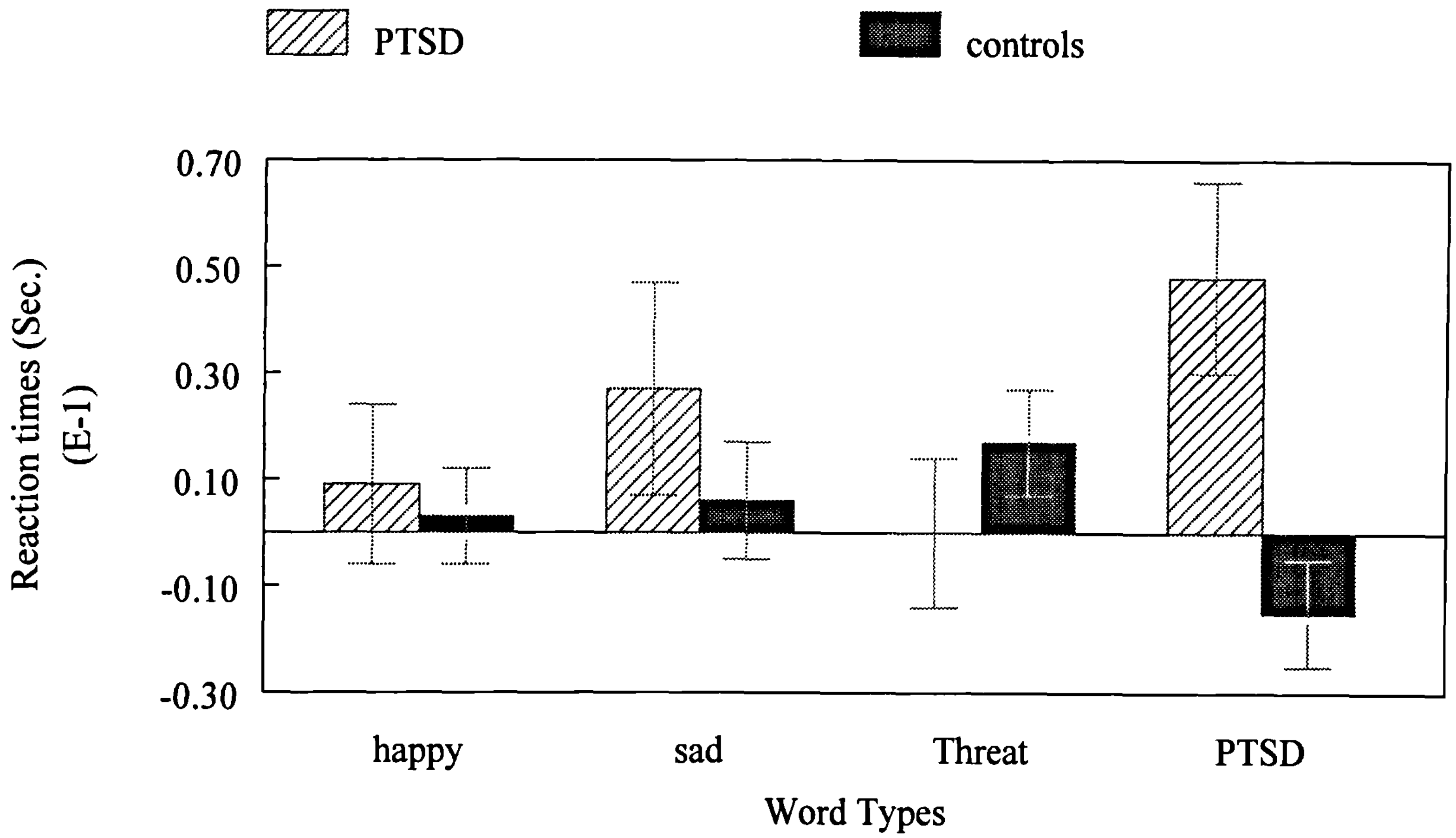
To investigate this effect of Word Type in the PTSD group further a series of ANOVAs was performed which compared the mean colour-naming times of for each set of emotional words (i.e. happy, depressed, threat and trauma-related words) with that for neutral words. The results only indicated a significant difference between trauma-related words and neutral words [$F(1, 22) = 6.72$, $P = 0.017$]. Appendix 5.3 shows the results for depressed words, happy words and threat words comparing with neutral words in PTSD patients.

5.8.4.3. Differential Index

This method was used in some of the previous studies (e.g., Williams & Broadbent, 1986; Kaspi & McNally, 1991; Thrasher, Dalgleish & Yule, 1994). An interference index was computed by subtracting the RTs to colour-name neutral words from the RTs to colour name the trauma, happy, threat, and depressed words (see Figure 5.2). These computed variables were compared across the two groups in a full factorial ANOVA of Index Type (4) X Group (2). The results showed a significant interaction [$F(1, 46) = 5.37$, $P = 0.002$], while the main effects of Group and Index Type were not significant (Appendix 5.4). Two sets of ANOVAs were carried out separately across the two groups to investigate this interaction. The results again revealed an effect of Word Type only in PTSD subjects [$F(1, 23) = 3.73$, $P = .015$] while not in control subjects [$F(1, 23) = 1.95$, $P = 0.130$].

To investigate this effect, a series of paired sample t-tests was carried out across PTSD patients for the four indices of words . The results indicated that the PTSD patients showed longer differential reaction times to colour-name the trauma-related words than happy words [$t\ (22) = 2.46$, $P = 0.022$], and threat words [$t\ (22) = 3.20$, $P = 0.004$], while there were no significant differences between the index of trauma-related words and depression-related words, or between other types of emotional words with each other i.e. happy, threat and depression-related words (Appendix 5.5).

Figure 5.2: Interference index in the colour-naming task for PTSD & controls



5.8.4.4. Type of Trauma Effect

Means and standard deviations were calculated separately for each group of patients i.e. RTA and PV on various measures of psychopathology (Table 5.3). One way ANOVAs showed that there were no significant differences between the two sub-groups for verbal IQ, reading ability, anxiety, and Impact of Event Scale (Appendix 5.6), but the PV group scored significantly higher on the DSRS [$F(1, 22) = 5.67$, $P = .027$] than the RTA group. The PVgroup was also significantly older than the RTA group [$F(1, 22) = 21.39$, $P = 0.0001$].

Table 5.3 Means and standard deviations (SD) of psychological scales for the two sub-groups of PTSD patients (i.e. RTA & PV)

	RTA (N = 13)		PV (N = 10)		
	MEAN	SD	MEAN	SD	
AGE (months)	139.3	29.8	182.6	13.5	**
WORD	102.6	9.6	101.6	15.1	n.s.
BPVS	103.2	10.2	94.4	20.0	n.s.
DSRS	11.0	4.5	17.3	8.8	*
RCMAS	13.7	7.6	17.4	8.3	n.s.
IES	32.2	14.8	36.6	24.5	n.s.
AVOIDANCE	16.5	9.3	20.2	12.3	n.s.
INTRUSION	15.6	6.7	16.4	12.5	n.s.

IES = Revised Impact of Event Scale, RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary Scale, WORD (Basic Reading) = Wechsler Objective Reading Dimensions * = $P < 0.05$ & ** = $P < 0.01$

Means and standard deviations for colour-naming latencies were calculated separately for each sub-group and each word type i.e. threat words (TW); sad words (SW); happy words (HW); neutral words (AW), and trauma-related words (PW). These data are shown in Table 5.4 and Figure 5.3.

Table 5.4. Means and standard deviations (SD) of colour-naming response latencies (sec.) for neutral (animal), happy, threat, sad and trauma (PTSD) words across two sub-groups (i.e. RTA & PV)

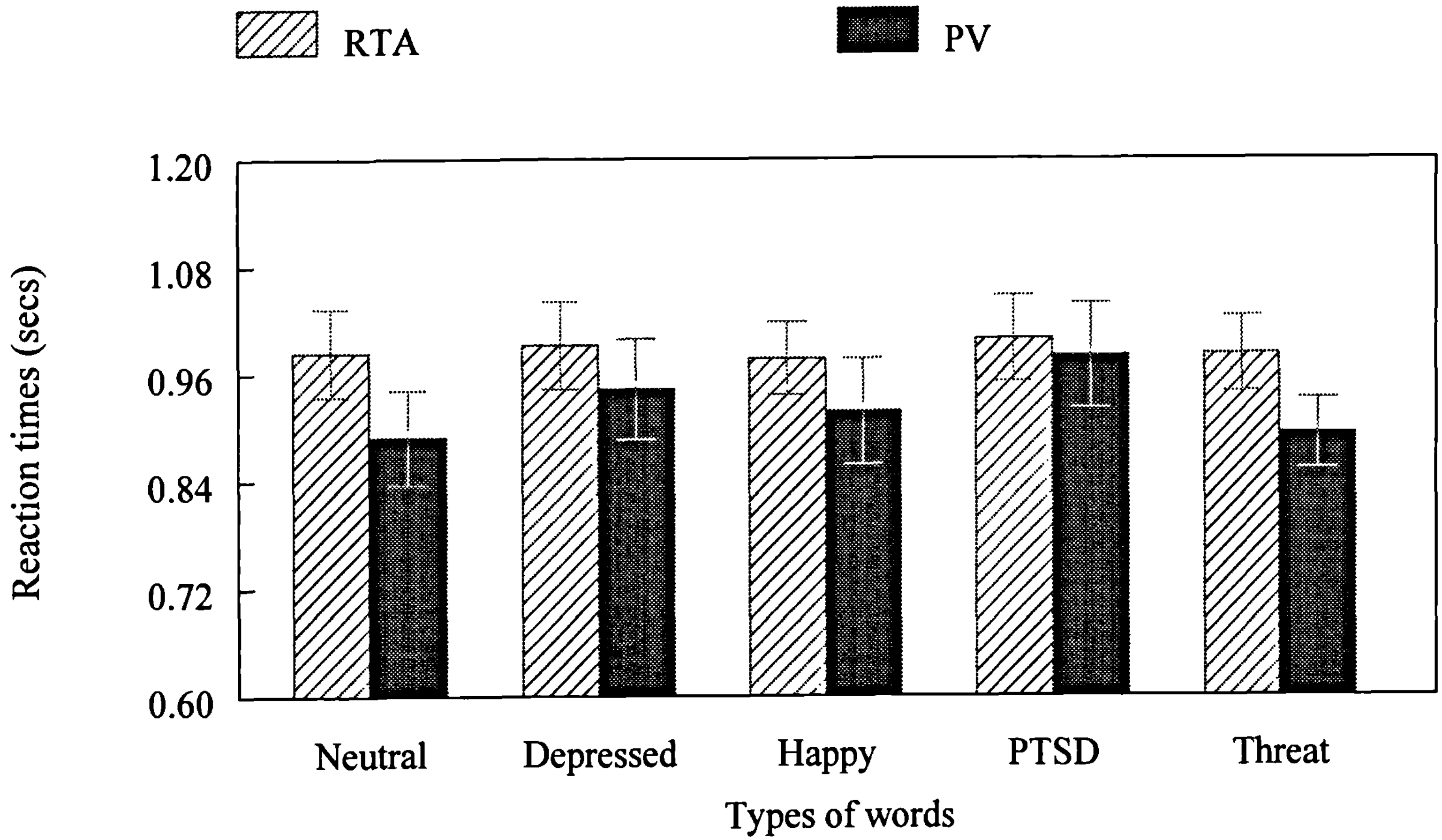
		WORD TYPE				
		NEUTRAL	HAPPY	THREAT	SAD	TRAUMA
RTA	MEAN	0.98	0.98	0.98	0.99	0.99
	SD	0.17	0.15	0.15	0.18	0.17
PV	MEAN	0.69	0.92	0.89	0.94	0.98
	SD	0.17	0.19	0.12	0.18	0.18

To investigate whether or not there were any differences between the two types of trauma a Group (2) X Word Type (5) ANOVA was performed. There were no main effects of Group nor any interaction (Appendix 5.7), but a significant of effect of Word Type was found [$F(1, 21) = 3.97$, $P = 0.005$].

To study the Word Type effect, a series of paired sample T-tests was carried out across the 5 categories of words. The results indicated significant differences between RTs of trauma-related words and neutral words [$t (22) = 2.59$, $P = 0.017$], trauma-related words and happy words [$t (22) = 2.46$, $P = 0.022$], and trauma-related words and threat words [$t (22) = 3.20$, $P = 0.004$], while between other types of words there were no differences. These results revealed that all patients had increased latency for trauma-related words.

The findings of ANOVAs with the interference indices replicated the findings with the original reaction-time data for the 5 different types of word; therefore, the interference analyses will not be considered further.

Figure 5.3: Mean reaction times on the Stroop colour-naming task for RTA & PV



RTA = Road Traffic Accident & PV = Personal Violence

5.8.4.5. Preliminary developmental analyses

Is the Stroop performance in young people with PTSD affected by developmental aspects? To examine this point, all subjects were divided into two sub-groups, those below 13 years old and those over 13 years old. Subject characteristics for both sub-groups of patients and controls are shown in Tables 5.5 and 5.7.

5.8.4.5.1. Children (under 13 years old)

One Way ANOVA showed that there were no significant differences between the two sub-groups 1 (aged under 13 years) on age, verbal IQ, reading ability, or self reported anxiety (although the scores were in the expected direction) (Appendix 5.8), but PTSD patients scored significantly higher on the measure of depression than controls [F(1, 15) = 4.57, P = 0.05].

Table 5.5 Means and standard deviations (SD) of psychological measures for the two child sub-groups 1, i.e. PTSD and normal subjects (aged under 13 years old)

	PTSD (N = 10)		NORMAL (N = 6)		
	MEAN	SD	MEAN	SD	
SEX (M:F)	4:6		2:4		
AGE (months)	119.40	17.83	133.33	18.64	n.s.
WORD	101.30	9.90	100.83	16.24	n.s.
BPVS	103.60	8.46	94.33	19.61	n.s.
DSRS	10.20	3.19	7.00	2.28	*
RCMAS	11.90	6.74	9.67	0.76	n.s.

IES = Revised Impact of Event Scale, RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary Scale, WORD (Basic Reading) = Wechsler Objective Reading Dimensions * = P < 0.05

Table 5.6 shows the means and standard deviations of colour-naming response latencies (sec.) for neutral (animal), happy, threat, depressed and trauma (PTSD) words across the two child sub-groups (i.e. PTSD and normal controls).

Table 5.6 Means and standard deviations (SD) of colour naming response latencies (sec.) for neutral (animal), happy, threat, depressed and trauma (PTSD) words across the two child sub-groups (i.e. PTSD and controls aged under 13 years)

		WORD TYPE				
		NEUTRAL	HAPPY	THREAT	SAD	TRAUMA
PTSD	MEAN	1.02	1.01	1.02	1.03	1.05
	SD	0.17	0.14	0.14	0.17	0.16
NORMAL	MEAN	0.89	0.92	0.94	0.92	0.87
	SD	0.10	0.11	0.08	0.07	0.07

To study the Stroop effect on children (under 13 years old) means of the RTs for the five types of word were submitted to a two-way, Group (2) X Word Type (5) mixed model ANOVA across the two sub-groups. The results showed a significant interaction [$F(4, 56) = 2.54$, $P = 0.05$], while the main effects of Group and Word Type were not found (Appendix 5.9).

To examine the interaction, two ANOVAs were performed across each group separately on the mean reaction times of the colour naming task for the five categories of word. The results indicated a non-significant difference across words in control subjects [$F(4, 20) = 2.43$, $P = 0.082$], while there was no difference across the words in the patient group [$F(4, 36) = 0.83$, $P = 0.515$]. This means that the PTSD patients and normal control children performed almost in the same way in the Stroop task.

To investigate this non-significant difference, a series of paired sample t-tests was carried out across control subjects for the five types of words. The results indicated that the control subjects showed longer differential reaction times to colour-name the trauma-related words than depression-related words [$t(5) = 2.96$, $P = 0.032$], and threat words [$t(5) = 2.48$, $P = 0.004$]. They also showed a trend towards longer reaction times to colour-name the happy words than trauma-related words [$t(5) = 2.48$, $P = 0.056$], while there were no significant differences between the RTs of other types of words with each other (Appendix 5.10).

5.8.4.5.2. Adolescents (over 13 years old)

One way ANOVA indicated that there were no significant differences between the two adolescent sub-groups (aged over 13 years) on age, verbal IQ, and reading ability (Appendix 5.11), but significant differences on self-reported anxiety [$F(1, 29) = 7.81$, $P = 0.009$], and depression [$F(1, 29) = 11.81$, $P = 0.002$] were found. Table 5.8 shows means and standard diviations (SD) of colour naming response latencies (sec.) for neutral (animal), happy, threat, depressed and trauma (PTSD) words across two adolescent sub-groups (i.e. PTSD and normal controls).

Table 5.7 Means and standard deviations (SD) of psychological measures for the adolescent sub-groups, i.e. PTSD and normal subjects (aged over 13 years old)

	PTSD (N = 13)		NORMAL (N = 17)		
	MEAN	SD	MEAN	SD	
SEX (M:F)	7:6		8:9		
AGE (months)	182.08	12.85	172.94	12.60	n.s.
WORD	101.69	13.81	97.88	18.17	n.s.
BPVS	94.46	18.40	95.53	16.78	n.s.
DSRS	16.08	8.66	8.00	3.86	**
RCMAS	16.61	8.96	9.12	5.71	**

IES = Revised Impact of Event Scale, RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary Scale, WORD (Basic Reading) = Wechsler Objective Reading Dimensions. * = P < .01, ** P = <.001

Table 5.8 Means and standard deviations (SD) of colour naming response latencies (sec.) for neutral (animal), happy, threat, depressed and trauma (PTSD) words across the two child sub-groups (i.e. PTSD and controls aged over 13 years old).

		WORD TYPE				
		NEUTRAL	HAPPY	THREAT	SAD	TRAUMA
PTSD	MEAN	0.88	0.90	0.88	0.92	0.94
	SD	0.16	0.17	0.12	0.17	0.18
NORMAL	MEAN	0.74	0.73	0.74	0.74	0.73
	SD	0.12	0.13	0.12	0.14	0.11

A repeated measures ANOVA of Group (2) X Word Type (5) was carried out to compare the two sub-groups (i.e. PTSD patients and normal controls over 13 years old). The results showed a main effect of Group [F(1, 28) = 12.2, P = 0.002] with the PTSD subjects being slower overall, and an interaction [F(4, 112) = 3.40, P = 0.012], but a Word Type main effect was not found [F(4, 112) = 1.611, P = 0.176].

To examine the interaction, two ANOVAs were performed across each group separately on the mean reaction times of the colour naming task for the five categories of word. The results indicated that a significant difference across words in the PTSD patients [F(4, 48) = 2.76, P = 0.038], while there was no difference across the words in the control group [F(4, 64) = 0.42, P = 0.794].

To investigate this significant difference, a series of paired sample t-tests was carried out across PTSD patients for the five types of words. The results indicated that the PTSD patients showed longer differential reaction times to colour-name the trauma-related words than neutral words [t (12) = 2.25, P = 0.044], and threat words [t (12) = 2.68, P = 0.02], while there were no significant differences between the RTs of other types of words with each other (Appendix 5.12).

5.8.4.6. Sex effect

Another question which still remains concerns whether the Stroop performance in young patients with PTSD is affected by their sex ? To examine this point, PTSD subjects were divided into two sub-groups: boys, and girls. Subject characteristics for both sub-groups of patients are shown in Table 5.9.

Table 5.9 Means and standard deviations (SD) of psychological measures for boys and girls with PTSD

	BOYS (N = 11)		GIRLS (N = 12)		
	MEAN	SD	MEAN	SD	
AGE (months)	155.81	36.42	153.92	35.38	n.s.
WORD	97.00	14.69	105.67	7.28	*
BPVS	95.09	15.64	97.83	15.74	n.s.
DSRS	12.27	5.24	14.67	8.95	n.s.
RCMS	11.91	7.84	17.00	8.16	n.s.
IES	26.60	18.05	39.42	19.30	n.s.
AVOIDANCE	13.50	8.94	22.64	10.75	**
INTRUSION	13.10	9.94	18.64	9.08	n.s.

IES = Revised Impact of Event Scale including Avoidance and Intrusion Subscales, RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary Scale, WORD (Basic Reading) = Wechsler Objective Reading Dimensions. * = $P < 0.1$ & ** = $P < 0.05$

Table 5.10 shows means and standard diviations (SD) of colour-naming response latencies (sec.) for neutral (animal), happy, threat, depressed and trauma (PTSD) words across girls and boys with PTSD.

Table 5.10 Means and standard deviations (SD) of colour-naming response latencies (sec.) for neutral (animal), happy, threat, depressed and trauma (PTSD) words across two sub-groups of PTSD patients (i.e. girls & boys)

		WORD TYPE				
		NEUTRAL	HAPPY	THREAT	SAD	TRAUMA
GIRLS	MEAN	0.91	0.93	0.92	0.94	0.98
	SD	0.17	0.19	0.15	0.18	0.19
BOYS	MEAN	0.97	0.97	0.96	1.00	1.00
	SD	0.18	0.14	0.14	0.17	0.17

One Way ANOVAs showed that there were no significant differences between boys and girls on age, verbal IQ, self-reported depression, self-reported anxiety, total scores on the Impact of Event Scale, and scores on the intrusion subscale (Appendix 5.13), but the results indicated a just significant difference on the avoidance sub-scale of the IES [$F(1, 20) = 4.44$, $p = .049$], and a trend was also found for reading ability [$F(1, 22) = 3.30$, $P = .083$], whit girl patients obtaining higher scores compared with boy patients.

To examine the sex effect on Stroop performance, an ANOVA of Group (2) X Word Type (5) was carried out. The results showed neither a main effect of Group, nor an interaction (Appendix 5.14), but a main effect of Word Type was found [$F(4, 84) = 3.11$, $P = 0.019$]. These results revealed that the boys and girls with PTSD performed in the same way on the Stroop task.

To investigate this Word Type effect, a series of paired sample t-tests was carried out across all PTSD patients for the five types of words. The results indicated that the PTSD patients showed longer differential reaction times to colour-name the trauma-related words than neutral words [$t (22) = 2.59$, $P = 0.017$], happy words [$t (22) = 2.46$, $P = 0.022$], and threat words [$t (22) = 3.20$, $P = 0.004$], while there were no significant differences between the RTs of other types of words with each other (Appendix 5.15).

5.8.4.7. Correlational Analyses

To investigate the relationships between age, verbal IQ, reading ability, depression, and anxiety scores on the one hand and interference times related to emotional words particularly trauma-related words on the other hand, a series of correlations was performed across all subjects. Another set of correlations examined the relationship between IES scores and colour-naming times in the PTSD subjects only. The results are shown in Tables 5.11 and 5.12.

Table 5.11 Correlations between psychological measures and interference times for emotional words across all subjects (N = 46)

	WORD TYPE				
	Happy	Depressed	Threat	Trauma	Neutral
AGE	0.20	0.07	-0.14	0.09	-0.43
P	0.19	0.65	0.37	0.55	0.003**
BPVS	-0.18	-0.35	0.21	-0.1	0.19
P	0.23	0.02*	0.16	0.49	0.21
DSRS	0.18	0.35	-0.33	0.54	0.23
P	0.24	0.02*	0.82	0.01**	0.13
RCMAS	0.21	0.26	0.08	0.43	0.17
P	0.16	0.08	0.61	0.003**	0.26
WORD	-0.13	-0.05	0.51	0.04	0.06
P	0.38	0.73	0.74	0.79	0.71

RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary Scale, WORD (Basic Reading) = Wechsler Objective Reading Dimensions.

* = P < 0.05 & ** = P < 0.01

Table 5.12 Correlations between scores IES including Avoidance and Intrusion Subscales & interference time for emotional words across PTSD patients (N = 23)

	WORD TYPE				
	Happy	Depressed	Threat	Trauma	Neutral
IES	0.39	0.43	0.35	0.45	0.26
P	0.07*	0.04**	0.11	0.037**	0.23
AVOIDANCE	0.30	0.34	0.26	0.36	0.18
P	0.19	0.13	0.26	0.11	0.43
INTRUSION	0.46	0.48	0.42	0.51	0.35
P	0.03**	0.03**	0.06**	0.017**	0.12

Table 5.13 Partial correlations between psychological measures and interference times for controlling those measures across all subjects (N = 46)

		WORD TYPE				
	Controlling	Happy	Depressed	Threat	Trauma	Neutral
DSRS	RCMAS	0.16	0.25	0.12	0.30	0.16
P		0.29	0.10	0.45	0.05*	0.31
RCMAS	DSRS	0.03	-0.02	0.05	-0.12	-0.16
P		0.87	0.89	0.77	0.94	0.92
WORD	BPVS	-0.7	0.17	0.01	-0.01	-0.07
P		0.63	0.91	0.96	0.95	0.67
BPVS	RCMAS	0.14	0.01	0.1	0.11	0.19

RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary Scale, WORD (Basic Reading) = Wechsler Objective Reading Dimensions. * = $P < 0.05$

As the results indicate there are strong positive correlations between interference times for trauma-related words and scores on the depression and anxiety scales, which means that high scores on these scales are associated with greater interference of trauma-related information. There is also a significant correlation between scores on the depression scale and interference time for depressed-related words. Finally the results revealed a negative correlation between verbal IQ and interference time for depressed words which indicates that high scores on the depression scale accompany low performance on the BPVS. There was a significant correlation between RTs for trauma-related words and total scores on the IES. Furthermore, there was a strong relationship between scores on the intrusion items of the IES and RTs to trauma-related words, but a non-significant correlation between scores on the avoidance items of the IES and RTs of trauma-related words. This means that high scores on the IES, particularly intrusion items, accompany high RTs towards trauma-related words. Positive significant correlations were also found between the scores of intrusion items of the IES and RTs of threat-related, depressed-related, and happy words. The correlational analysis revealed a negative significant correlation between age and RT to neutral words. In other words, older subjects have shorter RT towards neutral words. Interestingly, partial correlation analysis for all subjects indicated that there was a significant correlation between RTs of trauma-related words and DSRS depression score after controlling for RCMAS anxiety score, while there were no significant partial correlations between RTs of other types of words with psychological measures.

5.8.5. Preliminary discussion

In sum, the results of the modified Stroop task with children with PTSD reveal a strong significant main effect with PTSD patients being much slower than the normal control group. There was also a significant interaction across groups with a significant difference in colour-naming times between trauma-related words and neutral words only in the PTSD patients. This supports the hypothesis that children and adolescents with PTSD show an attentional bias towards trauma-related words. Preliminary developmental analysis indicated that children with PTSD showed no significant differences in their reaction times to different words, despite an interaction with the profile of colour-naming in controls. In contrast, adolescents with PTSD were slower to colour-name trauma-related words. However, it is important to note that the power of these developmental analyses is low as the sample sizes in the child groups are very small and it is possible that greater power could reveal a significant Word Type effect in children with PTSD. Comparison of girls and boys with PTSD indicated no sex effect on the Stroop task.

Correlational analysis showed a significant correlation between RTs for trauma-related words and the IES scores particularly the intrusion items. This means that high scores on the IES particularly for intrusion items accompany high RTs towards trauma-related words which is in agreement with Cassiday et al.'s study (1992).

The results of the current experiment with the Stroop paradigm have shown that words closely related to trauma produce more interference than negative words less closely related to trauma including threat-related and depression-related words or positive emotional words in children and adolescents with PTSD, though this effect is stronger in adolescents. The findings of this study are in line with those in adults. Cassiday et al. (1992) found that subjects with rape-related PTSD exhibited more interference for trauma-related words than for words less related to the trauma. Thrasher et al. (1994) also reported that shipwreck survivors with PTSD showed more interference for words strongly related to the trauma than for general threat words. See the general discussion at the end of the chapter for further examination of these results.

5.9. EXPERIMENT (2)
EMOTIONAL STROOP EFFECTS IN CHILDREN OF ADULTS WITH PTSD

5.9.1. Introduction

The results of Experiment 1 revealed that, like adults with anxiety disorders, child and adolescent patients with PTSD exhibited biases to trauma-related cues. To extend these findings it is necessary to study attentional bias with other groups of subjects involved with traumatic events directly or indirectly. One such possibility is to study the children of parents with PTSD. There are two studies involving children of parents with emotional disorders (Schneider et al., 1992; Motta et al., 1994).

Schneider et al. (1992), used a modified card Stroop colour naming task with asymptomatic children of parents with panic, phobic disorders and of parents without any psychiatric disorder. The investigators found specific relationships between parent and child characteristics. The highest interference scores occurred in exactly those children groups whose parents had the diagnosis that corresponded to the word content. Thus, children of panic patients showed a larger attentional bias to panic-relevant words than children of phobic patients and children of normal controls. Conversely, children of phobic patients showed a larger attentional bias to phobic-relevant words than children of the other two groups.

Motta et al. (1994) studied secondary traumatisation in adult children of Vietnam veterans using a modified Stroop task. They compared the mean colour-naming time of 9 adult children of veterans with 35 children of non-veterans on the Stroop task. The subjects were presented with five cards, each one containing 100 words: positive, neutral, obsessive compulsive (e.g., filthy, faeces), PTSD (bodybags), and meaningless. The words were printed in red, black, blue, green and yellow ink. Despite the low power, the results indicated differences in colour-naming time between children of veterans and those of non-veterans on the PTSD card. The authors also found that there were no significant differences between the groups on trauma measures such as the Impact of Event Scale and the MMPI-2 PTSD Scale. In summary, this study replicated the results from Schneider et al. (1992) with children of panic and phobic patients.

The present experiment sought to extend and replicate the findings of Motta et al. with a larger sample and with non-combat-related PTSD in the parents.

5.9.2. Hypothesis

Children of parents with PTSD (parents who were involved in a traumatic event in which their children were not involved) will show a significant latency on a colour-naming task towards negative words, particularly trauma-related words, compared with normal-control subjects.

5.9.3. Subjects

Eighteen children and adolescents, aged 9 to 17, whose parents met Diagnostic and Statistical Manual of Mental Disorders (3rd Edition, DSM-III-R; American Psychiatric Association, 1987) and International Classification of Diseases (World Health

Organization, ICD-10; 1992) criteria for PTSD, were matched on age, sex, verbal IQ and reading ability with a group of children and adolescents whose parents had not any psychiatric problems. All the parents with PTSD were involved in either road traffic or personal violence events, while their children were not. All the adult patients and their children were introduced by the clinicians of the Psychology Department of the Institute of Psychiatry. Of the 18 children of adults with PTSD, 9 were boys and 9 girls with a mean age of 154.89 months (SD 35.33). The control group was the same as in Experiment 1.

Colour-blind subjects and those who had low scores on Basic Reading (below 85) and British Picture Vocabulary (below 85) tests were excluded. Psychological measures and, the experimental task, and the design were the same as for Experiment 1.

5.9.4. Results

5.9.4.1. Subject Characteristics

Means and standard deviations were calculated separately for each group on various measures of psychopathology for patients, and controls. One way ANOVA showed that there were no significant differences between the groups for age, verbal IQ, reading ability, or RCMAS score (Appendix 5.16), but the children of adults with PTSD scored significantly higher on the depression scale [$F(1, 40) = 5.98$, $P = 0.019$]. Table 5.13 indicates the results of psychological measures for children of adults with PTSD and normal control subjects.

Table 5.14 Means and standard deviations (SD) of psychological measures for children of adults with PTSD and control subjects

	CH.PTSD		NORMAL		
	MEAN	SD	MEAN	SD	
SEX (M:F)	9:9		10:13		
AGE (months)	154.89	35.33	162.83	22.72	n.s.
WORD	99.50	6.29	98.43	15.64	n.s.
BPVS	100.44	14.45	95.39	17.27	n.s.
DSRS	11.39	5.98	8.48	4.53	*
RCMAS	11.56	7.01	9.78	5.12	n.s.

RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary Scale, WORD (Basic Reading) = Wechsler Objective Reading Dimensions. * = $P < 0.05$

5.9.4.2. Colour-Naming Reaction Times

Means and standard deviations for colour-naming latencies were calculated separately for each group and each word type i.e. threat words (TW); sad words (SW); happy words (HW); neutral words (AW) and trauma-related words (PW). A summary of these data is shown in Table 5.14 and Figure 5.4.

The mean response latencies were submitted to a two-way, Group (2) X Word Type (5) mixed model ANOVA. The results did not show a main effect of Group [$F(1, 39) = 2.02$, $P = 0.163$], but did reveal a significant Word Type X Group interaction [$F(4, 156)= 2.98$, $P = 0.02$], which qualified a main effect of Word Type [$F(4, 156) = 2.43$, $P = 0.05$].

Table 5.15. Mean and standard deviations (SD) of colour naming response latencies (sec.) for neutral (animal), happy, threat, depressed & trauma-related words across the two groups i.e. children of adults with PTSD and controls.

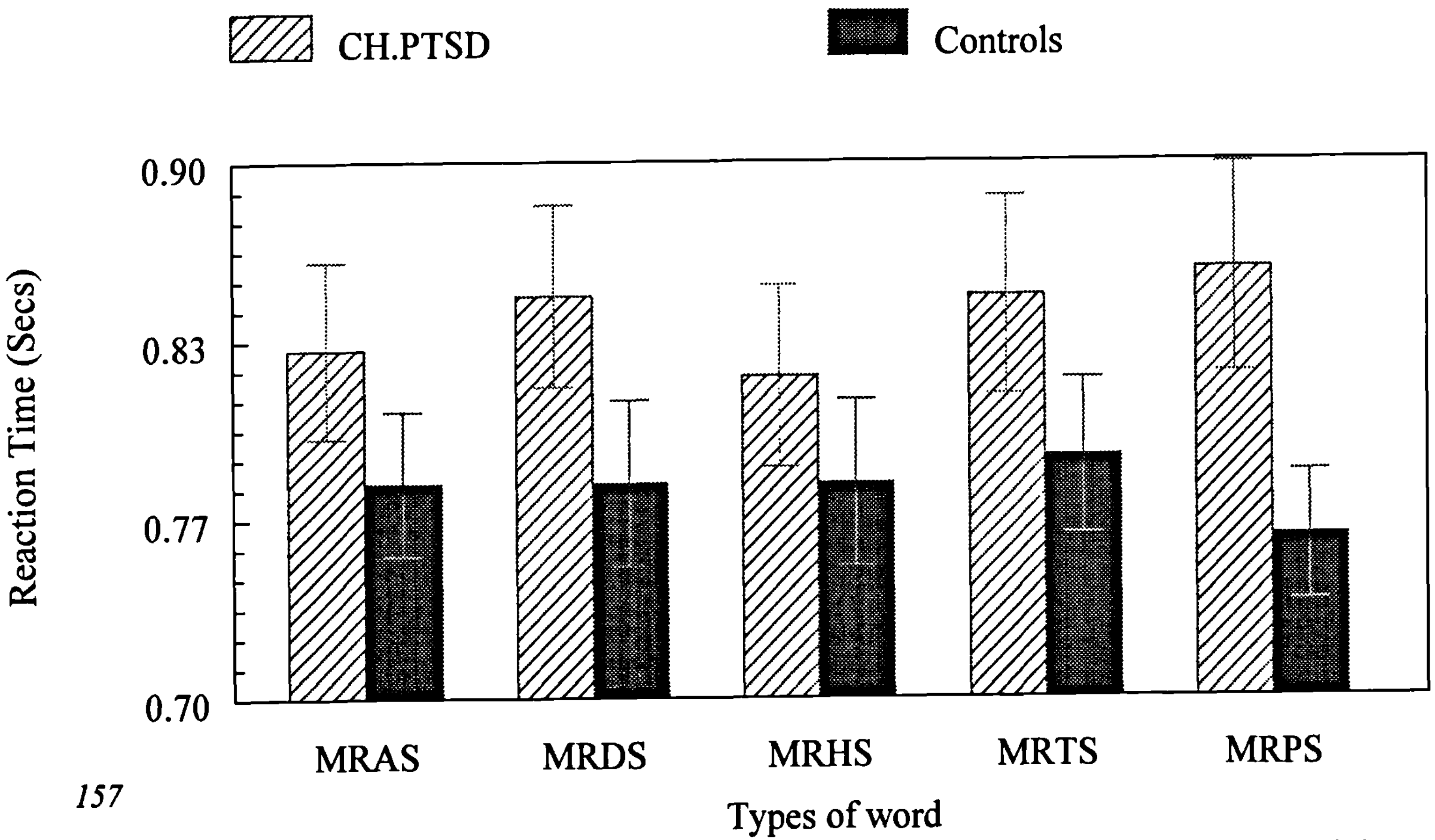
		WORD	TYPE			
		NEUTRAL	HAPPY	THREAT	SAD	TRAUMA
CH.PTSD	MEAN	0.83	0.82	0.86	0.85	0.86
	SD	0.14	0.14	0.16	0.14	0.17
NORMAL	MEAN	0.77	0.77	0.79	0.78	0.76
	SD	0.13	0.15	0.14	0.15	0.11

CH.PTSD = Children of adults with PTSD

To examine this interaction two ANOVAs examining children of PTSD and control groups separately for the five types of words were performed. Results revealed a significant effect of Word Type for the children of adults with PTSD [$F(4, 68)=3.47$, $P = 0.012$], but not for the control group [$F(4, 88) = 1.75$, $P = 0.146$].

To investigate this Word type effect in children of PTSD patients and thus whether or not the emotional Stroop effect was specific to trauma words or other types of emotional words, a series of ANOVAs was performed which compared the mean reaction times on the colour naming task for each set of emotional words (i.e. happy, depressed, threat and trauma-related words) with neutral words. A marginally significant difference between trauma-related words and neutral words [$F(1, 17) = 4.21$, $P = 0.056$], and a trend between threat words and neutral words [$F(1, 17) = 3.33$, $P = 0.086$] were found. While there was no differences between RTs of happy or depressed words relative to the neutral words (Appendix 5.17).

Figure 5.4: Mean reaction times on the Stroop colour-naming task



MRAS=mean RT on the animal words, MRDS=mean RT on the depressed words, MRHS=mean RT on the happy words, MRTS=mean RT on the trauma words, MRTS=mean RT on the threat words

CH.PTSD = Children of adults with PTSD

5.9.4.3. Preliminary Developmental Analyses

Is the Stroop performance in children of adults with PTSD affected by developmental aspects? To study this point, as with the data from Experiment 1, all subjects were divided into two sub-groups, those under 13 years old and those over 13 years old. Subject characteristics for both sub-groups of patients and controls are shown in Tables 5.15 and 5.17.

5.9.4.3.1. Children (under 13 years old)

One way ANOVAs showed that there were no significant differences between the two sub-groups (aged under 13 years) on age, verbal IQ, reading ability, RCMAS anxiety, DSRS or depression (Appendix 5.18).

Table 5.16 Means and standard deviations (SD) of psychological measures for children of adults with PTSD and normal subjects (aged under 13 years old)

	CH.PTSD (N = 9)		NORMAL (N = 6)		
	MEAN	SD	MEAN	SD	
SEX (M:F)	7:2		2:4		
AGE (months)	125.44	19.49	133.33	18.64	n.s.
WORD	100.22	9.04	100.83	16.24	n.s.
BPVS	102.44	16.73	94.33	19.61	n.s.
DSRS	10.66	7.31	7.00	2.28	n.s.
RCMAS	9.89	8.30	9.67	0.76	n.s.

RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary Scale, WORD (Basic Reading) = Wechsler Objective Reading Dimensions

Table 5.16 shows colour naming response latencies (sec.) for neutral (animal), happy, threat, depression-related & trauma-related words across the two groups i.e. children of adults with PTSD and controls aged under 13 years old.

Table 5.17. Means and standards deviations (SD) of colour naming response latencies (sec.) for neutral (animal), happy, threat, depressed & trauma-related words across the two groups i.e. children of adults with PTSD and controls aged under 13 years.

		WORD	TYPE			
		NEUTRAL	HAPPY	THREAT	SAD	TRAUMA
CH.PTSD	MEAN	0.90	0.88	0.94	0.90	0.93
	SD	0.14	0.14	0.15	0.15	.16
NORMAL	MEAN	0.89	0.92	0.94	0.92	0.87
	SD	0.01	0.11	0.08	0.07	0.07

CH.PTSD = Children of adults with PTSD

To study the Stroop effect on the children under 13 years old, means of the RTs for the five types of words were submitted to a two-way, Group (2) X Word Type (5) mixed model ANOVA. The results showed a significant interaction [$F(4, 52) = 2.68$, $P = 0.041$], while, neither a main effect of Group nor Word Type was found (Appendix 5.19).

To examine the interaction, two ANOVAs were performed for each group separately on the mean reaction times of the colour naming task for the five categories of word. The results indicated that significant difference across words in children of adults with PTSD subjects [$F(4, 32) = 2.66$, $P = 0.05$], while there was a trend in the control group [$F(4, 20) = 2.43$, $P = 0.08$].

To investigate the word effect across children of adults with PTSD subjects, a series of paired sample t-tests was carried out for the five types of words. The results indicated that the children of adults with PTSD showed longer differential reaction times to colour-name the threat words than depression-related words [$t (8) = 3.21$, $P = 0.012$], and happy words [$t (8) = 3.11$, $P = 0.014$],while there were no significant differences between the RTs of other types of words with each other (Appendix 5.20).

Another set of paired sample t-tests was carried out to investigate the trend effect across control subjects for the five types of words. The results indicated that the control subjects showed longer differential reaction times to colour-name the trauma-related words than depression-related words [t (5) = 2.96, P = 0.032], and threat words [t (5) = 2.48, P = 0.004]. They also showed a trend towards longer reaction times to colour-name the happy words than trauma-related words [t (5) = 2.48, P = 0.056], while there were no significant differences between the RTs of other types of words with each other (Appendix 5.21).

5.9.4.3.2. Adolescents (over 13 years old)

One way ANOVAs indicated that there were no significant differences between the two groups aged over 13 years on age, verbal IQ, and reading ability, or RCMAS anxiety (Appendix 5.22). There was a trend, however, for the children of adults with PTSD to be older than the controls and for them also to be more anxious. But there was a significant difference on DSRS depression [F(1, 25) = 5.84, P = 0.024] with the children of adults with PTSD being more depressed.

Table 5.18 Means and standard deviations (SD) of psychological measures for children of adults with PTSD and normal subjects (aged over 13 years old)

	CH.PTSD (N = 9)		NORMAL (N = 17)		
	MEAN	SD	MEAN	SD	
SEX (M:F)	2:7		8:9		
AGE (months)	184.33	17.94	172.94	12.60	n.s.
WORD	98.78	0.67	97.88	18.17	n.s.
BPVS	98.44	12.44	95.53	16.78	n.s.
DSRS	12.11	4.62	8.00	3.86	*
RCMAS	9.00	13.22	9.12	5.71	n.s.

RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary Scale, WORD (Basic Reading) = Wechsler Objective Reading Dimensions. * = P < 0.05

Table 5.18 shows colour naming response latencies (sec.) for neutral (animal), happy, threat, depressed & trauma-related words across the two groups i.e. children of adults with PTSD and controls aged over 13 years.

Table 5.19. Means and standard deviations (SD) of colour naming response latencies (sec.) for neutral (animal), happy, threat, depressed & trauma-related words across the two groups i.e. children of adults with PTSD and controls aged over 13 years.

		WORD TYPE				
		NEUTRAL	HAPPY	THREAT	SAD	TRAUMA
CH.PTSD	MEAN	0.76	0.76	0.78	0.80	0.79
	SD	0.11	0.12	0.12	0.12	0.15
NORMAL	MEAN	0.74	0.73	0.74	0.74	0.73
	SD	0.12	0.13	0.12	0.14	0.11

CH.PTSD = Children of adults with PTSD

A repeated measures Group (2) X Word Type (5) ANOVA was carried out to compare the groups (i.e. children of adults with PTSD and normal controls over 13 years old). The results showed no main effect of Group, interaction, or Word Type effect (Appendix 5.23). These preliminary findings revealed that adolescent children of adults with PTSD and normal adolescent subjects performed in the same way on the modefied Stroop task.

5.9.4.4. Sex Effect

To examine any sex effect between boys and girls among PTSD children, the subjects were divided into two groups. Subject characteristics for both groups are shown in Table 5.19.

One way ANOVAs showed that there were no significant differences between boys and girls on age, verbal IQ, RCMAS anxiety, or reading ability (Appendix 5.24). But there was a trend on DSRS depression [$F(1, 15) = 3.99$, $P = .065$], with girls tending to be more depressed than boys.

Table 5.20 Means and standard deviations (SD) of psychological measures for boys and girls of adults with PTSD

	BOYS (N = 9)		GIRLS (N = 9)		
	MEAN	SD	MEAN	SD	
AGE (months)	142.75	29.66	166.87	10.83	n.s.
WORD	98.00	6.52	98.75	7.70	n.s.
BPVS	100.50	19.27	100.50	11.64	n.s.
DSRS	8.50	5.29	14.25	6.18	*
RCMAS	9.25	6.85	14.00	7.67	n.s.

RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary Scale, WORD (Basic Reading) = Wechsler Objective Reading Dimensions. * = P < 0.1

Table 5.20 shows the colour naming response latencies (sec.) for neutral (animal), happy, threat, depressed & trauma-related words across the two groups of children of adults with PTSD i.e. girls and boys with PTSD.

Table 5.21. Means and standard deviations (SD) of colour naming response latencies (sec.) for neutral (animal), happy, threat, depressed & trauma-related words across girls and boys of children of adults with PTSD.

		WORD TYPE				
		NEUTRAL	HAPPY	THREAT	SAD	TRAUMA
BOYS	MEAN	0.83	0.90	0.94	0.92	0.95
	SD	0.14	0.14	0.14	0.14	0.16
GIRLS	MEAN	0.77	0.73	0.77	0.77	0.77
	SD	0.13	0.09	0.12	0.10	0.12

To examine the sex effect on Stroop performance, an ANOVA of Group (2) X Word Type (5) was carried out. The results revealed a main effect of Group [F(1, 14) = 5.88, P = 0.029] with girls being faster to react than boys, and no interaction [F(4, 56) = 0.35, P = 0.84], but a trend of Word Type effect [F(4, 56) = 2.42, P = 0.059] was found.

To investigate this trend, a series of paired sample t-tests was carried out across all children of adults with PTSD for the five types of words. The results indicated that children of adults with PTSD showed significantly longer reaction times to colour-name depression-related words than happy words [t (17) = 2.65, P = 0.016], trauma-related words than happy words [t (17) = 2.51, P = 0.023], and threat words than happy words [t (17) = 2.51, P = 0.022]. They also showed non-significantly longer reaction times to colour-name trauma-related words than neutral words [t (17) = 2.05, P = 0.056], and threat words than neutral words [t (17) = 1.83, P = 0.086], while there were no significant differences between the RTs of other types of words with each other (Appendix 5.25).

5.9.4.5. Correlational Analyses

To find the relationships between age, verbal IQ, reading ability, depression, and anxiety on the one hand and interference times related to emotional words particularly trauma-related words on the other hand, a series of correlations was performed across all the subjects. The results are shown in Table 5.21.

Table 5.22 Correlations between psychological measures and interference times for emotional words across Children of adults with PTSD and normal subjects (N = 41)

	WORD TYPE				
	Happy	Depressed	Threat	Trauma	Neutral
AGE	-0.20	0.06	-0.40	-0.19	-0.53
P	0.88	0.68	0.01*	0.23	0.001
BPVS	0.15	-0.03	0.06	0.19	-0.04
P	0.34	0.68	0.73	0.23	0.80
DSRS	-0.39	-0.04	-0.01	0.12	-0.09
P	0.01*	0.81	0.95	0.46	0.59
RCMAS	0.09	0.01	0.10	0.20	-0.14
P	0.57	0.95	0.52	0.20	0.37
WORD	-0.05	-0.07	0.11	0.05	0.06
P	0.76	0.66	0.50	0.73	0.71

RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary Scale, WORD (Basic Reading) = Wechsler Objective Reading Dimensions. * = $P < 0.05$

As the results indicate there is a negative correlation between interference time of threat words and age factor, this means that with increasing age, interference time of threat words comes down. In other words, younger subjects showed more interference than older ones. A negative correlation between DSRS depression and the interference time of happy words was also found, which means that high scores on the depression scale accompany shorter interference times for happy words.

5.10. COMPARISON BETWEEN CHILDREN WITH PTSD AND CHILDREN OF ADULTS WITH PTSD

5.10.1. Subject Characteristics

Analyses were carried out comparing children with PTSD, children of adults with PTSD and controls. One way ANOVAs showed that there were no significant differences between the groups for age, verbal IQ, and reading ability (Appendix 5.26), but children with PTSD scored significantly higher on DSRS depression [$F(2, 63) = 5.79$, $P = 0.005$] and RCMAS anxiety [$F(2, 63) = 3.45$, $P = 0.038$]. Post hoc analysis (Scheffe) indicated that these differences were related only to the PTSD patients.

5.10.2. Colour-naming reaction times

To compare the three groups of subjects used in Experiments 1 and 2 and also to find any differences between children with PTSD and children of adults with PTSD on the emotional Stroop task, a full-factorial ANOVA with WordType (5) X Group (3) was carried out. This indicated that there was a main effect of Group [$F(2, 61) = 8.85$, $P < 0.001$], an interaction [$F(8, 244) = 2.98$, $P = 0.003$] and a main effect of Word Type [$F(4, 244) = 2.86$, $P = 0.024$].

To study the Word Type effect a series of paired sample t-tests was carried out between pairs of 5 categories of words. The results indicated that all the subjects including PTSD patients, children of adults with PTSD and normal controls had more latency to colour-name trauma-related words than neutral words [$t\ (64) = 2.24$, $P = 0.029$] and happy words [$t(64) = 2.20$, $P = 0.031$].

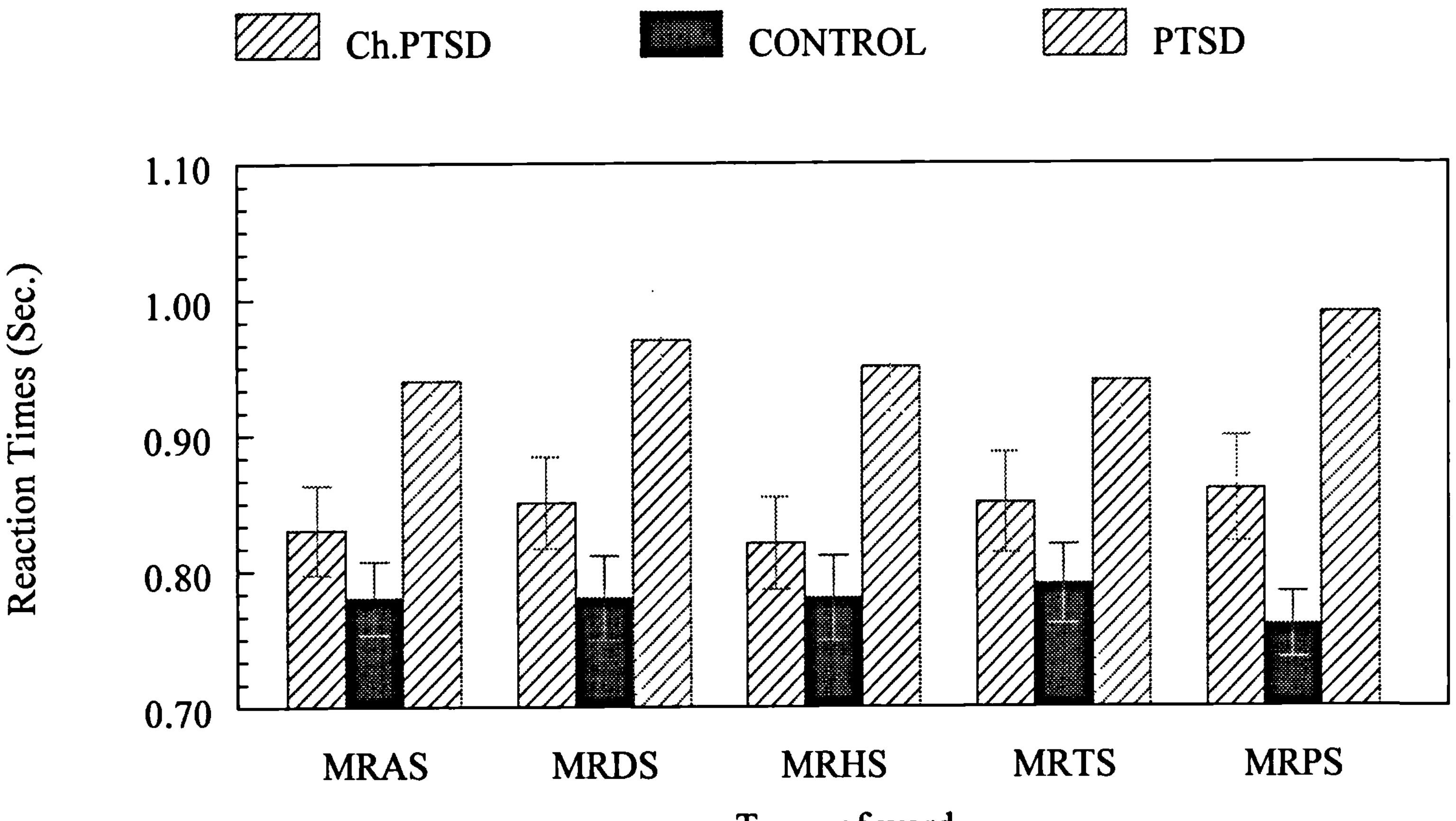
Separate ANOVAs for each group separately are reported earlier in the chapter and reveal differential slowing for trauma-related words in the PTSD subjects and the children of adults with PTSD but not in the contrls.

A second ANOVA was carried out between child PTSD patients and children of adults with PTSD. The results indicated that there was a significant main effect of Group [F(1,

39) = 5.89, P = 0.02], but no interaction [F(4, 156) = 1.44, P = 0.224]. The results also revealed a Word Type effect across the two groups [F(4, 156) = 4.71, P = 0.001].

To study the Word Type effect a series of paired sample t-tests was carried out between pairs of 5 categories of words. The results indicated that all the subjects including PTSD patients and children of adults with PTSD had more latency on trauma-related words than neutral words [t (41) = 3.30, P = 0.002], happy words [t (41) = 3.53, P = 0.001], and threat words [t (41) = 2.59, P = 0.013]. All subjects also had more latency on depression-related words than happy words [t (41) = 2.20, P = 0.034].

Figure 5.5: Mean RT's on colour-naming task for PTSD, CH.PTSD & controls



MRAS=mean RT on the animal words, MRDS–mean RT on the depressed words, MRHS=mean RT on the happy words, MRTS=mean Rt on the trauma words, MRTS–mean RT on the threat words

5.11. Discussion

The main aim of the current study was to investigate the performance of young people with PTSD and children of adults with PTSD relative to controls on the Stroop colour-naming task. In line with previous literature on adult subjects, it was expected that the children and adolescents with PTSD and children of adults with PTSD should show greater interference towards trauma-related information than controls on the task.

In summary, the results indicated that children and adolescents with PTSD showed longer reaction times towards trauma-related material relative to the controls. The results also revealed no significant difference between two sub-groups of PTSD patients who had experienced road traffic accident and personal violence. Regarding developmental aspects, although children with PTSD (under 13 years) performed almost the same as controls, adolescents with PTSD exhibited longer RTs towards trauma-related words relative to controls. Regarding sex effects, no significant difference was found between girls and boys with PTSD. Correlational analyses revealed a positive correlation between RTs for trauma-related material and the scores on the DSRS depression and RCMAS anxiety scales. There was a significant correlation between RTs for trauma-related words and scores on the IES which was mainly carried by the intrusion items.The results of the second experiment indicated that children of adults with PTSD exhibited longer RTs for trauma-related and threat words relative to neutral words and to controls. Children (under 13 years) of adults with PTSD showed longer latencies towards trauma-related and threat material relative to controls, while adolescent of adults with PTSD performed roughly the same as controls. No sex effect was found across boys and girls of adults with PTSD. Correlational analyses indicated that high scores on the depression scale accompany shorter interference times towards happy words.

In accordance with the hypothesis, the results indicated that young patients with PTSD exhibit a selective processing bias for trauma related words relative to other types of words i.e. general threat, depressed, happy and neutral words. The PTSD group also showed a significantly longer latency to name the colour of all the words compared with the control group. Moreover, the degree of interference for trauma-related words was significantly related to a self-report measure of intrusive cognitions and avoidance concerning the subject's own trauma (i.e. IES, Horowitz et al., 1979). According to Dawkins and Furnham (1989), the emotional cues in the Stroop task may activate task-irrelevant, self-preoccupying processes which divide limited attentional capacity, thereby slowing colour-naming. It has been also argued that long term disorders create cognitive fear structures which are activated during emotional arousal (Foa et al., 1989; Williams, Watts, MacLeod & Mathews, 1988). Patients with PTSD are thought to develop fear structures which are related to the traumatic event, and the presentation of information which is represented in a fear structure is assumed to activate it and consequently to evoke post-traumatic reactions (see Chapter 3). In line with this, Cassiday et. al. (1992) showed that the amount of interference correlates with the score on the Impact of Event Scale (intrusion sub-scale) in a similar way to the present data. These findings suggest that the Stroop paradigm may provide a nonintrospective method for assessing negative thoughts and avoidance behaviours in children who suffer from PTSD.

The trend correlation between RT's to trauma words and scores on the depression scale and the strong relationships between RT's to the depression-related words and total scores of IES and intrusion items of IES support the idea that PTSD may have a comorbidity with depression. Clinical findings report that depression is often secondary to PTSD and high rates of co-occurrence of depression and PTSD in epidemiological studies have been thoroughly established (Blank, 1994). In the attentional deployment task, PTSD patients tended to shift attention away from depressed words, a trend towards a correlation between depressed bias scores and total scores of the IES was found which is in contrast with the group results.

The results of this study support previous findings using the modified Stroop tasks with adults who suffer from PTSD (e.g. Trandel & McNally, 1987; McNally et al., 1990; McCarthy et al., 1990; Ehlers et al., 1988; Foa et al., 1991; Foa et al., 1991; and Thrasher et al., 1994). Similar patterns of selective processing of threat material in other adult anxious patients have also been reported (e.g. Mathews & MacLeod, 1985; Mogg et al., 1989 and Mathews et al., 1993).

Furthermore, these results are in agreement with the few other studies with children e.g. Schneider et al.(1992) which have found specific Stroop interference in children of panic and phobic patients for congruent words and Martin & Jones, (1992) who found interference on the modified Stroop task with phobia words in children with spider phobia.

The results also suggest that the Stroop interference to trauma-related words is associated with experiencing PTSD rather than simply with exposure to a specific trauma. Indeed, the two sub-groups of traumatised subjects (i.e. trauma related to Road Traffic Accident & Personal violence) did not differ with respect to their performance on the task. Thus, whereas the Stroop task presented three types of negative words i.e threat, depressed and trauma-related words, both groups of PTSD subjects only exhibited Stroop interference for trauma-related words. Several additional studies support the conclusion that this interference is associated with PTSD itself (Kaspi & McNally, 1991; McNally, English, & Howard, 1993; 1992; Foa et.al, 1991; Thrasher, Dalgleish & Yule, 1994; Martin and Jones, 1992; Kaspi et al., 1995; Vrana et al., in press).

Regarding the second experiment, the results revealed that the children of PTSD subjects showed a greater interference to trauma-related words than other words and relative to controls. They also showed more interference to general threat words than neutral and positive words. These results indicate that the children of parents suffering from PTSD are affected by their parents' problems. It seems that the trauma played a threatening role in their cognitive structures because they are also affected by general threat cues. This finding is consistent with the Schneider et.al; (1992) study which found a specific relationship between parent and child characteristics. Children of parents with panic problems showed greater interference to panic words than other groups, whereas children of phobic patients showed a larger Stroop bias to phobia-relevant content. The data also supported Motta et. al.'s (1994) finding that children of adults with PTSD on the modified Stroop task indicated a significant latency to trauma-related words relative to the control group and suggested that a Stroop task containing emotionally-related words may be more sensitive than current standard measures in detecting the effects of secondary trauma.

As discussed in Chapter 2, Green et al. (1991) reported that children's PTSD is associated with parental PTSD symptoms and family factors. Schwarz and Perry (1994) also postulated that a family which includes a symptomatic child-parent model may lead to the members synergistically triggering each other leading to arousal, re-experiencing, and avoidance symptoms in vicious cycles. The characteristics of such a system depend on individual, pre-event and post-event factors. So, it seems reasonable that the child is affected by the parent's traumatic experience. The presence of cognitive fear structures which are created by the parent's traumatic events can possibly explain this interference. As discussed in Chapter 3, fear structures are the patterns of interpretation of information which are stored in the child's memory which seem to facilitate the integration of new information (in this case the traumatic event experienced by the parent) about one's experiential world. Activation of fear structures leads to interference of other structures that are required for the integration of information relevant to competing tasks.

Developmental considerations show that younger patients (aged under 13 years) exhibited shorter reaction time towards trauma-related words on the Stroop task relative to older patients (aged over 13 years), while younger children of adults with PTSD (under 13 years) exhibited greater interference towards trauma-related and threat materials relative to older subjects (over 13 years old). Correlational analyses with PTSD patients indicated that there were no relationships between age and total scores of the IES, Intrusion items of IES, or Avoidance items of the IES. These findings indicate that younger children of adults with PTSD should be more vulnerable than older children of adults with PTSD towards parents' traumatic events.

One possible explanation of this difference is terms of Pynoos et al.'s (1995) developmental model. According to Pynoos et al., as children grow up, their cognitive abilities change, and they rely less on external cues in their appraisal of life threat, and more on internal cues for understanding the potential threat. Adolescents may rely on their appraisals and images of threat, even when it is not carried out (see Chapter 2). In the case of PTSD patients, it might be that older patients appraise the consequnces of a traumatic event more internally so that, in the absence of traumatic cues, they may be involved whit the internal reminders of the traumatic event. In contrast, perhaps younger patients pay less attention to internal cues and more to external cues. Therefore, a Stroop task may produce more interference towards trauma-related words in older patients than younger ones. Regarding children of adults with PTSD, it seems that younger subjects may appraise the traumatic event of their parents as an external cue more than older subjects. Therefore, they showed longer reaction times towards trauma-related and general threat words.

As a summary the results of these two experiments revealed that the two groups of subjects were affected in different ways i.e. the children of adults with PTSD were affected by general negative words including trauma-related information while the PTSD group was effected just by trauma-related stimuli, probably because they were directly involved in the events whereas the children of adults with PTSD did not directly experience the traumatic events.

The present study shows that a modified Stroop paradigm with suitably selected words that are matched for length, frequency of usage and emotional valence can be used to investigate processing biases in children with PTSD and children of adults with PTSD. This methodology can be used to investigate developmental aspects of emotional processing in traumatised children.

CHAPTER 6

AN INVESTIGATION OF ATTENTIONAL BIAS IN CHILDREN AND ADOLESCENTS WITH PTSD USING THE PROBE DOT TASK

6.1. Introduction

The relationship between emotion and cognition is an important area of cognitive psychology (see Chapter 3). Experimental research in this area increasingly uses a variety of methods. Earlier research studies were concerned with the effect of manipulating the emotionality of the stimulus on performance on cognitive tasks and concluded that the processing of negative information is often suppressed. In the last decade, a body of research using different experimental methods such as the Stroop paradigm, lexical decision tasks, explicit and implicit memory tasks, and attention deployment tasks clarified this issue. The Stroop paradigm has already been discussed in Chapter 5, and memory bias (recall and recognition) will be discussed later (in Chapter 7). The main focus of this chapter is on the attentional deployment or probe dot task.

This paradigm was introduced by MacLeod, Mathews and Tata (1986) and enables one to measure visual attention distribution directly. In this task, pairs of words were presented to two areas on the screen, one in the upper and the other in the lower area. The subjects were asked to read the upper word ignoring the lower one. Occasionally a small dot was presented on the screen after the words had disappeared for a short interval in the same location as one of the words. The subject was instructed to press a key immediately when the dot was detected. Detection latencies, which provided a sensitive measure of visual attention, were recorded for probes automatically. On the trials of interest, one of the two words was threat-related and when the dot followed a threat word rather than a neutral word, the patients were relatively faster in detecting the dot if it was in the same position as the threat word, and slower if it was in the non-threat position, compared with normal subjects. Using such words with anxious subjects suggested that anxious patients deploy attention more to threat words than does the normal population.

MacLeod et al. (1986) mentioned two advantages for the deployment methodology: first, it avoids using self-report questionnaires that can affect the result of any test because of response bias, self report methods capture only those aspects of cognition which can be verbalised, and such data only provide limited support for the cognitive model of the anxiety disorders (see Chapter 3). Second, the probe dot task gives the opportunity for the direct assessment of visual attention, because it requires a neutral response (button press) to a neutral stimulus (probe dot). This is different from, for example, the Stroop task, which requires a response to an emotional stimulus and is thus more susceptible to response bias effects.

In spite of some advantages, it seems that this paradigm also suffers from some limitations. First MacLeod et al. (1986) emphasised shifts in attention with anxious subjects shifting attention towards threat and normal subjects away. However, another possibility is that all subjects immediately shifted attention to the location of the threat word, but the anxious subjects could not shift their attention away due to their appraisial of the word which is more threatening than in normals. Dalgleish (1994) argued that although this interpretation is still an attentional effect, it may not be an attentional bias. A second limitation of this task is that upper and lower screen positions are supposed to be equivalent. However, the methodology requires subjects to read the top word of the pair and so it seems that these two positions are quite different. A subject has to read a threat word at the top of the screen on half of the critical trials and then respond to a probe either at the top or the bottom of the screen, therefore the resultant reaction time is not a measure of the subject's attentional bias for the threat word, because the subject was already attending to the threat word in order to read it.

6.2 Probe dot interference in adults with anxiety disorders

This paradigm has been used in several studies in the last decade to assess attentional bias in people with emotional disorders. All subjects recruited in these studies were either clinical or non-clinical anxious or depressed subjects.

In the prototypical study referred to above, MacLeod, Mathews, and Tata (1986) tested 32 subjects (16 anxious patients and 16 normal controls). The patients were divided into two equal sized sub-groups according to whether they reported worrying primarily over physically- or socially- related concerns. The task consisted of 24 physical threat and 24 social threat words each paired with a neutral word. Each word pair was presented on the screen of the microcomputer for 500 ms. Dot probes occurred on 96 of the 288 trials and could replace either of the two displayed words. Dot probes only occured on trials with a threat word. The results clearly supported the original hypothesis that high anxiety leads to a bias in selective attention toward emotionally threatening information, whereas normal subjects tended to shift attention away from such information. It means that clinically anxious patients detect the probes which replaced threat-related words faster than the probes which replaced non threat words.

Mogg, Mathews and Eysenck (1992) assessed attentional responses to threat stimuli using the attentional probe dot task in anxious patients, subjects who had recovered from a clinical anxiety state, and normal controls. They found that : (I) anxious patients are relatively faster at detecting probes which replaced threat rather than non-threat words. So, the finding of MacLeod et al.'s (1986) study was replicated. (II) The social threat words are related to the severity of the social worries of anxious patients, but not the physical threat words. This means, at least in the area of social worries, that the bias is related to the predominant worries of anxious patients. And (III) the responses of the recovered anxious patients are not significantly different from those of either the currently anxious or control groups.

Asmundsen, Sandler, Wilson, and Walker (1992) studied attentional performance in 18 panic attack patients and 18 normal control subjects using the probe dot deployment task. Physical threat and social threat words were extracted from MacLeod et al.'s (1986) research. The results revealed a significantly longer reaction time to detect the probe in the anxious group compared with normal subjects. Interestingly, panic patients showed an attentional bias toward physical threat cues i.e. when the probes replaced a physical threat stimulus, the patients detected the probes faster than when the probe followed social threat cues, while normal subjects exhibited equal response latencies for probes following both physical and social threat cues. Also, they found a significantly greater attentional deployment effect in the patient group when the probe appeared in the upper position where subjects were actively reading, than when it appeared in the lower area. These findings were consistent with those MacLeod et al. (1986).

Beck, Stanley, Averill, Baldwin and Deagle (1992) presented the task to a group of panic disorder patients and a normal control group. However, the task which was used in this experiment had two differences to that used by MacLeod et al. (1986). First, the dot probe appeared simultaneously with the word pair, on the left side of either the top or bottom word. They argued that presenting the dot probes after the word pair offset is not a 'true' dual task procedure and even a small delay between the primary (threat-related words) and secondary (dot probe detection) tasks can affect reaction times. They assert that, "...when interference of the secondary task occurs in the presence of threat related stimuli on the primary task, attentional bias is inferred" (P. 626). Second, subjects were asked to press the key to indicate both the presence and absence of detection probes. They state that this modification reduced the possibility of a motor response bias instead of reaction time differences in both groups. The results showed that panic disorder patients revealed slower reaction times to detect probes which replaced physical panic-related threat, social threat, and positive emotional stimuli but not neutral stimuli.

In summary, the results of these few studies suggest that the attentional probe dot paradigm provides a good indication of the subject's visual attention following a threat word presented on the computer screen. It seems that further studies with different types of emotional disorders will help to clarify a clear interpretation of the task.

6.3. Attentional probe dot Interference in Sub-clinical anxious subjects

MacLeod and Mathews (1988) selected 36 medical students to participate in the attentional deployment task. All subjects completed both the Spielberger State-Trait Anxiety Inventory (STAI) and the Beck Depression Inventory (BDI) on two occasions, 12 and 1 week before a major examination. The subjects were divided into two equal-sized groups by performing a median split on the basis of their trait anxiety scores. The main task included a short practice session consisting of 32 neutral word pairs and 288 experimental trials which were presented on the VDU screen of a microcomputer. The results suggested that the attentional response to generally threatening stimuli is primarily associated with the level of trait anxiety. Hence, high-trait subjects but not low-trait subjects tended to shift attention towards generally threatening stimuli on both test occasions. High and low trait subjects showed no attentional bias towards or away from examination-relevant stimuli a long time before the examination. However, the results were quiet different when the levels of state anxiety were high (one week before examination). At that time, high trait subjects showed an increased attentional bias towards such threat stimuli, while low-trait subjects showed increased attentional avoidance of such stimuli. They concluded that the attentional bias to currently relevant stimuli may be associated with neither trait nor state anxiety alone, but with an interactive function involving both these variables.

Mogg et al. (1990) carried out a research study consisting of two different experiments, colour-naming and attention deployment tasks. In the second experiment, out of 100 medical students, the highest 20 and lowest 20 scorers on the trait version of the STAI were recruited. The critical stimuli were 24 general threat and 24 achievement threat words. Each of 288 pairs of words was presented for 500 ms and two factors were varied independently, i.e. threat position and probe position. The main aim of this study was to examine whether or not an attentional bias for threat information is a function of state or trait anxiety. To manipulate the stress level of the subjects, they used an anagram task presented by a computer and giving false feedback for each stress condition. The result of this experiment failed to show a relationship between trait anxiety and attentional bias in the non-clinical population. However, both experiments indicated that all subjects under high stress exhibited an attentional bias towards threat-related cues, whereas subjects in the low-stress condition showed no such effect.

Fox (1993) selected 30 subjects from a general population of students to perform an attentional probe dot task. The subjects were divided into three groups, high anxious i.e. those who scored above the population mean on STAI-trait and below the population mean on the Marlowe-Crowne Social Desirability Scale (MC: Crowne & Marlowe, 1960), low anxious who were below the mean on both scales, and repressors who were below the mean on STAI-trait and above the mean on the MC. All the words used in this study were drawn from Mathews et al's (1989) study. Fox demonstrated that the task clearly distinguished between the groups: high-anxious subjects shifted visual attention towards socially threatening stimuli; low-anxious subjects showed no consistent pattern of attentional bias; repressors shifted visual attention away from such stimuli. This pattern was not obtained for physical threat words. The author concluded that her results replicate the findings of MacLeod and Mathews (1988) that the high trait anxious subjects shift attention toward emotionally threatening material in their visual environment and, further, that low-trait anxiety subjects cannot necessairly be considered as a homogeneous group.

Broadbent and Broadbent (1988) performed a probe dot task study using normal subjects with high and low trait anxiety. Their study included four experiments. In the first experiment, the subjects performed a task similar to that of MacLeod et al. (1986) which used two sets of words i.e. physical and social threat and neutral filler words; the second experiment was the same as experiment 1 but filler pairs were replaced by new pairs that each contained one animal name; experiment 3 was the same as experiment 2 with a difference in the order of presentation of threat and animal pairs; and finally, the fourth experiment was similar to experiment 1 with a difference in the exposure time of pairs of words. The results indicated a selective attentional bias related to anxiety and no relationship appeared for neutral information. Trait anxiety made little difference but if State was added into the analysis, the best relationship was found with an interaction with Trait. Broadbent and Broadbent concluded that: "... the effect must be to some extent due to lasting personality characteristics. It is not something that happens to everybody when in a temporary state"(1988, P. 165).

In conclusion, these studies appear to suggest that anxiety, particularly clinically diagnosed generalized anxiety disorder, is associated with an attentional bias to threat, and attentional responses to prolonged stress may be determined by individual differences in vulnerability to anxiety. These findings are also supported by other studies using different methods to assess attentional bias in anxiety disorders i.e., the Stroop colour-naming task (for more details see Chapter 5), the colour-perception task (Mogg et al., 1991), the two string lexical decision task (MacLeod & Mathews, 1991; Mogg et al. 1991), the dichotic listening paradigm (Mathews & MacLeod, 1986; Burgess et al., 1981; Foa & McNally, 1986; & Trandal & McNally, 1987) and the attentional search task (Mathews et al., exp. 1 & exp. 2, 1990). For more information see Eysenck (1992) and Williams et al. (1988).

6.4. Visual attentional biases in depressed individuals using attention deployment tasks

The most influential theory regarding cognitive processing in depression is Beck's (1967; Beck, et al., 1979) theory (see Chapter 3 for a detailed discussion). Beck suggested that several cognitive processes are involved in the aetiology and maintenance of depression. He postulated that depressed people are characterised by a "cognitive triad", in which they exhibit a negative view of themselves, of their experience, and of the future. Depressed individuals also engage in faulty information processing, including overgeneralising from negative experiences, selectively abstracting negative details out of context, and taking personal responsibility for negative events. Finally, according to Beck's theory, depressed people are characterised by negative schemata, and these affect the encoding, storage and retrieval of information. Several studies have been conducted testing Beck's theory. Overall, the results have provided mixed support for this aspect of Beck's cognitive model of depression and in this section these studies which have employed the dot probe task are considered.

MacLeod et al. (1986) in the same study in which they investigated anxious subjects (see literature review of attentional deployment and anxiety), recruited a group of 16 subjects with a primary diagnosis of depression and tested them on the same paradigm. The main aim behind the study was to test this hypothesis that the attentional bias toward emotionally threatening words may be associated with depression rather than anxiety. The mean BDI score in this group was very reliably higher than that of either anxious subjects, or the non-anxious controls. However, the results indicated no significant bias towards threat words in the depressed group.

Gotlib, McLachlan and Katz (1988) conducted a study using a modified attentional deployment task to examine Beck's postulate that depressed persons attend to depressed or negative content. They selected 24 subjects on the basis of their scores on the Beck Depression Inventory (BDI; Beck et al., 1961): 12 subjects with BDI scores of 5 and below as the non-depressed group; and 12 subjects whose scores were 10 and greater as the depressed group. The attentional deployment task consisted of three types of stimuli - manic-neutral, depressed-neutral, and manic-depressed. The results indicated that the depressed subjects did not attend to depressed content words more frequently than they did to manic- or neutral-content words. Thus, these findings failed to support Beck's theory (Beck et al., 1979) that depressed people selectively attend to negative stimuli and experiences. In contrast, the non-depressed individuals were found to attend more frequently to manic content words than to depressed or neutral words and did not attend to neutral-content words more or less frequently than they did to depressed-content words.

Hill and Dutton (1989) recruited two groups (N = 16 in each) of subjects, a depressed group with a mean BDI score of 21.3 (SD = 8.4) and a non-depressed group with a mean of 2.0 (SD = 1.5). The critical stimuli consisted of 32 words which had previously been rated as self-esteem threatening by a student sample and a set of emotionally neutral words. All subjects participated in the attentional deployment task. The results revealed that, as expected, depressed subjects showed significantly longer overall reaction times. However, in spite of the longer reaction times of depressed individuals, no evidence was found that depression is associated with greater selective attention to negative stimuli. A trend was found for depressed subjects to show better recall than non-depressed subjects for threat words, but the group did not differ in the recall of emotionally neutral words. They concluded that depression is not associated with a bias to show greater selective attention to stimuli threatening self esteem.

To summarise, the findings of the very few studies on depressed subjects using the attentional deployment task suggest that depressed people do not exhibit an attentional bias to threat. This is in agreement with some of the research using the Stroop paradigm with depressed individuals (see Chapter 5). These findings support Williams et al., (1988) model which proposed greater strategic processing of emotional infromation in depressed subjects and bout automatic processing (see Chapters 3 & 5 for a discussion).

6.5. Attentional bias in children and adolescents using the attentional probe dot task

There are a few published or unpublished research studies using the attentional deployment task to assess attentional bias in children and adolescents with emotional disorders. As with the adult research, these few studies have been done on subjects with anxiety disorders other than PTSD and there is no study with children and adolescents who suffer from PTSD.

Vasey, Elhag & Daleiden (1994, unpublished) carried out a study with high and low anxious children to examine attentional bias on a probe detection task. There were 40 subjects selected from 365 children in the sixth and eighth grades. Based on cut-off scores, 20 subjects (10 boys and 10 girls) whose scores on the Test Anxiety Scale for Children (TASC, Sarason et al., 1960) were 12 or greater for boys (M = 17.6, SD = 3.7) and 16 or greater for girls (M= 19.0, SD= 2.7) were designated the high-test anxious group. Twenty subjects (10 boys and 10 girls) whose scores were 7 or less for boy (M = 5.0, SD = 2.3) and 10 or less for girls (M = 5.3, SD = 3.3) were designated the low-test-anxious group. The task was a modified probe detection task based on MacLeod et al. (1986). The duration of word presentation was 1250 (msec) and it consisted of 160 trials of which 60 were followed by probes. Forty of the 60 probed trials were critical trials which contained emotionally threatening words and there were 20 probed trials in which both words were neutral in content. The results revealed that high-test-anxious children, like clinically-anxious adult patients show a clear attentional bias toward emotionally threatening stimuli. Furthermore, this study provides the first evidence that the attentional bias away from emotionally-threatening stimuli seen among low-anxious adults also occurs among low-test anxious children. Finally the authors concluded that selective attention mechanisms influence children's processing of threatening information and may play a role in the regulation and dysregulation of childhood anxiety.

Vasey, Daleiden, Williams & Brown (1995) followed up their earlier study and used the attentional probe dot task to examine the hypothesis that children with anxiety disorders show an attentional bias toward threat words, while the normal controls show an attentional bias away from threat words. They selected 12 anxious patients and 12 normal subjects aged 9 to 14-years-old. All anxious children met criteria for a diagnosis of at least one anxiety disorder such as overanxious, separation anxiety, social phobia, avoidant disorder, obsessive compulsive, simple phobia and posttraumatic stress disorders. Both groups of subjects were matched for age, sex and socioeconomic status. The subjects also completed the Vocabulary sub-test of the Wechsler Intelligence Scale for Children-Revised (WISC-R; Wechsler, 1974) and the Word Identification sub-test of the Woodcock Reading Mastery Test-Revised (WRMT-R; Woodcock, 1987). The probe detection task was presented to the subjects with a 1250 msec presentation time for each word. The results supported the hypothesis that anxiety-disordered children exhibit a mood-congruent attentional bias toward emotionally threatening cues. The correlational analysis also showed that there was not a significant relationship between attentional bias and depression score. Furthermore, it replicated the findings of Vasey et al. (1994) in test-anxious children, suggesting that such an attentional bias is a reliable phenomenon among anxious children.

Taghavi,Neshat, Moradi, Yule & Dalgleish (in preparation) employed the same paradigm as MacLeod, Mathews, & Tata (1986) with anxious and depressed children. The only difference between this study and that of MacLeod et al.(1986) is that in the former, the experimenters used three types of word instead of two: physical threat, social threat and depressed relevant stimuli. Twenty three children suffering from anxiety disorders, 16 with depression and 23 normal controls matched for sex, age and verbal IQ participated in this research. The results indicated that anxious children, but not depressed, mixed depressed/anxious children nor normal controls, consistently deploy attention towards both types of threat-related stimuli but not to depression-related stimuli. These findings with depression are in agreement with the results with adult depressed subjects (Gotlib et al., 1988; Hill & Dutton, 1989; see above).

In sum, the results of the few studies with anxious children and adolescents using a modified attentional deployment task have indicated that anxious subjects have shown biases in their attention towards threat stimuli (Vasey et al., unpublished; 1995; Taghavi et al., unpublished) but that the results with depressed children (Taghavi et al., unpublished) are in line with the results of the two studies with adult depressed subjects (Gotlib et al., 1988; & Hill & Dutton, 1989) which are in contrast with Beck's postulation (Beck et al., 1979) that depressed individuals selectively attend to negative cues and experiences. Both sets of studies revealed that depressed subjects did not attend to depressed-relevant words more than they did to neutral-content words.

Unfortunately, there is no published study on adults or children and adolescents who suffer from PTSD using the attentional deployment task. The main aim of the current research is to study attentional bias in children and adolescents with PTSD in a different way from the Stroop task. As MacLeod et al. (1986) hypothesised, whereas anxious subjects seemed to shift their attention towards the threatening materials, control subjects seemed to shift their attention away from threatening stimuli. A modified probe dot task used to test this hypothesis with child and adolescent PTSD subjects as a sub-group of anxiety disorder.

6.6. Experiment

6.6.1 Hypothesis

Children who suffer from PTSD will show a significant attentional bias (on the Attentional Deployment Task) towards threat stimuli i.e. physical threat, and social threat and depression-related words relative to normal control subjects but should show no such bias for depression-relevant stimuli.

6.6.2. Method

6.6.2.1. Design

Probe detection latencies were subjected to a full factorial ANOVA with repeated measures that included Group (2:PTSD patients vs. normal control subjects) as the between-subjects factor and Word Type (2: threat words including physical threat + social threat / 2 vs. depressed-related words) as the within-subjects factor. For further analyses, another repeated measures ANOVA involving Threat Position (2: upper threat vs. lower threat) and Probe Position (2: upper probe vs. lower probe) was carried out. The dependent variable was RT to the dot probe.

6.6.2.2. Subjects

Twenty four children and adolescents aged 9 to 17 who met Diagnostic and Statistical Manual of Mental Disorders (3rd Edition-Revised, DSM III-R; American Psychiatric Association, 1987) and International Classification of Diseases (World Health Organization, ICD-10, 1992) criteria for PTSD were matched on age, sex, verbal IQ and reading ability with a group of children and adolescents without any psychiatric problems (see subject characteristics). All PTSD subjects were involved in either Road Traffic or Personal Violence accidents. Most of the patients were recruited from the Children's Department of the Mausdely Hospital, and had been seen by Prof. W. Yule. A few subjects were also identified from other clinics in London or out of London. Of the 24 PTSD subjects, 13 were boys and 11 girls with a mean age of 154 months (SD=34.53). The control group was recruited from several primary and secondary schools from different parts of London. Of the 24 normal subjects, 13 were boys and 11 girls with a mean age of 154 months (SD=22.12).

Those subjects who had low scores on a Basic Reading (below 85) and British Picture Vocabulary (below 80) tests were excluded (see subject characteristics).

6.6.3. Materials

The probe detection task of MacLeod et al. (1986) was modified for use with children and adolescents. Forty eight emotional words in three sets were used in this study: 16

physical threat (e.g. explosion, murder), 16 social threat (e.g., confused, rejected) and 16 depression-related (e.g., lonely, lost). All of the words were chosen from "The Dictionary of Emotional Words for Children and Adolescents" which was generated by children and adolescents in a separate study (see Chapter 4). Each emotional word was matched with a neutral word for length and frequency. Ten psychologists rated the threatening words which had already been produced by children, as social or physical threat or both. One hundred and forty eight neutral words, matched for length and frequency, with the emotional words, were used as fillers. These words again were selected from the same source. The practice trials consisted of 12 pairs of neutral words (Appendix 6.1 shows the different sets of words used in the attentional probe dot task). The task consisted of 198 trials; 64 out of 198 were followed by probes. The 48 critical trials were designed to yield a 3 (social threat, physical threat and depression-related) X 2 (upper threat vs lower threat) X 2 (upper probe vs lower probe) within subjects factorial design. In the upper threat (UT) trials, the upper word was emotionally threatening and the lower word was emotionally neutral. In lower threat (LT) trials, the upper word was neutral and the lower word was emotionally threatening (for more details see instrumentation).

To compare the results of this study withother studies using anxious and depressed children with the same procedure (see Chapter 9) only social threat, physical threat, and depressed materials and not trauma-related words were used.

6.6.3.2. Instrumentation

The following instrumentation was used in this task:

(I) Computer: An IBM-PC 486 portable computer with a colour LCD screen.

(II) Key buttons: The key buttons consisted of one button for recording subjects' reaction time to the probe dots which controlled the stimulus presentation and allowed for visual probe detection latencies with 1 msec. accuracy. The program of this test was designed by the experimenter and written by Mr Les Law, programmer in the Institute of Psychiatry. These tests have been checked by psychologists and psychiatrists several times and revised after pilot studies.

6.6.3.3. Task presentation

The presentation model of the task is almost the same as MacLeod et al.'s (1986) and Mogg et al.'s (1990) studies with some minor differences. These differences are as follows:

1- An IBM portable, PC III, computer was used to present the stimuli. Word pairs were presented on a blue computer screen.

2- Presentation time of each word was 1500 msec., because the subjects were children and adolescents (i.e. under 17 years old) and required longer to press the material. The subject was seated about 60 cm. from the screen of the computer. The screen of the computer measured approximately 24 cm by 18 cm. The font of the words was 24 with a visual angle of less than 2 degrees.

3- The emotional stimuli were presented randomly in three different sets (physical threat, social threat and depressed-related).

Each word-pair was presented for 1500 msec, in random order with 3 cm. distance from the centre of the screen of the computer, above or below (visual angle of less than 2 degrees). On the 48 critical trials (threat-neutral and sad-neutral word pairs) and on 48 filler trials, a dot probe replaced either of the two displayed words and remained on the screen until the subject's response; on the other 100 filler trials without probe, the next word pair followed in 1000 msec. On each critical trial, the threat or sad word could appear with equal probability in either the upper or lower position. The probe could follow in either position with equal probability, yielding two independent factors: Threat Position and the position of the subsequent visual probe (Probe Position). The combination of these two factors gave rise to four possible conditions, and for any subjects, 12 of the 48 critical trials appeared in each condition.

6.6.3.4. Psychological measures

The following psychological measures were used in the current study:

1- ***The Revised Children's Manifest Anxiety Scale*** (RCMAS; Reynolds & Richmond, 1978).

2- ***The Depression Self-Rating Scale*** (DSRS, Birleson, 1981).

3- ***The British Picture Vocabulary Scale*** (BPVS, short form, Dunn et al., 1981).

4- ***The Wechsler Objective Reading Dimensions*** (WORD, Basic Reading, Rust et al., 1993).

5- ***The Revised Impact of Event Scale*** (IES, Horowitz et al., 1979).

For details of all the psychological measures see Chapter 5.

6.6.4. Procedure

The task was carried out individually. The subject was asked to sit in front of the computer in a quiet room, and was told to read the following instruction on the screen of the computer.

> In this task you are going to see words presented on the screen in pairs. One word will appear just above the centre of the screen, and one just below. Please read the top word of each pair aloud as soon as it appears. Sometime when the two words disappear a small dot will remain either in the area where the top word appeared or in the area where the bottom word appeared. When you see the dot, press the button as quickly as possible. Are there any questions?

Then the task continued if there was no question. When the subject understood the instructions s/he was asked to start the task with the following sentence.

> Press the button when you are ready.

Twelve trials including 4 probe trials, but no threat words, were presented to the subject as a practice session. Afterwards, the subject was asked by the following question.

> O.K. Would you like more practice?

If there was no question, the subject began the main experiment. The subject received a break in the middle of the session for 3 minutes.Subsequently, the subject was asked to complete the psychological questionnaires (i.e. Impact of Event Scale, anxiety, depression, BPVS, and Basic Reading scales). It is important to say that the results of a pilot study with 5 normal children and adolescents showed that the task had been established well and the subjects were interested in it. In all, the task took 20-25 minutes.

6.6.5. Results

6.6.5.1. Subjects Characteristics

Means and standard deviations were calculated on various measures of psychopathology for the patient and control groups (see Table 6.1). One way ANOVAs showed that there were no significant differences between the groups for age, verbal IQ and reading ability (Appendix 6.2), but as expected, the clinical group scored significantly higher on the measures of depression [$F(1, 47) = 10.75$, $P = 0.002$] and anxiety [$F(1, 47) = 5.11$, $P = 0.029$]. PTSD patients scores on the Impact of Event Scale are comparable with Yule et al.'s studies of child survivors of shipping disasters (e.g.Yule et al.,1992).

Table 6.1 Mean and standard deviations (SD) of psychological measures for PTSD and controls

	PTSD (N = 24)		CONTROLS (N = 24)		
	MEAN	SD	MEAN	SD	
Age (months)	154.00	34.53	154.00	22.12	n.s.
WORD	100.58	12.35	105.50	17.13	n.s.
BPVS	98.17	15.16	97.21	15.30	n.s.
DSRS	13.62	7.20	8.37	3.14	**
RCMAS	14.62	8.07	10.42	4.24	*
IES	34.05	19.19	-	-	-
Intrusion	15.68	9.56	-	-	-
Avoidance	18.36	10.49	-	-	-

IES = Revised Impact of Event Scale including two sub-scales i.e. intrusion & avoidance, RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary Scale, WORD (Basic Reading) = Wechsler Objective Reading Dimensions * = P < 0.05 & ** = P < 0.01

6.6.5.2. Performance on the Attentional Deployment Task

To minimise the influence of outlying data points, probe detection latencies less than 100 msec and more than 3sec were extracted for all subjects, in line with previous research. The mean probe detection latencies were calculated separately for each condition for both groups i.e. PTSD patients and normal controls. Tables 6.2, 6.3, and 6.4 show the means and standard deviations for the subjects across depressed and threat words (threat condition = physical condition + social condition /2).

Table 6.2 Means and standard deviations (SD) of probe detection latencies for threat words (physical threat + social threat /2) in sec.

	PTSD		CONTROLS	
	Upper Area	Lower Area	Upper Area	Lower Area
Threat in	0.672	0.699	0.482	0.448
Upper Area	(SD = 0.261)	(SD = 0.345)	(SD = 0.143)	(SD = 0.100)
Threat in	0.716	0.708	0.450	0.474
Lower Area	(SD = 0.321)	(SD = 0.300)	(SD = 0.092)	(SD = 0.167)

Table 6.3 Means and standard deviations (SD) of probe detection latencies for depressed words in sec.

	PTSD		CONTROLS	
	Upper Area	Lower Area	Upper Area	Lower Area
Depressed in	0.760	0.714	0.451	0.475
Upper Area	SD = 0.443	SD = 0.367	SD = 0.149	SD = 0.220
Depressed in	0.637	0.738	0.481	0.464
Lower Area	SD = 0.263	SD = 0.325	Sd = 0.234	SD = 0.129

Table 6.4 Means and standard deviations (SD) of bias indices for different types of words in sec (threat bias = social bias + physical bias / 2).

	Social Bias	Physical Bias	Depressed Bias	Threat Bias
PTSD	0.044	-0.001	-0.073	0.017
SD	0.205	0.126	0.165	0.133
CONTROLS	-0.048	-0.001	0.003	-0.029
SD	0.122	0.077	0.085	0.083

MacLeod and Mathews (1988) provided a formula in which "the relationship between Threat Position by Probe Position was simplified in order to provide a single index of attentionally mediated speeding of response to threat words by substituting the appropriate detection latencies into the following equation:

Attentional Bias Score = [(UP/LT-UP/UT)+(LP/UT-LP/LT)]/2

where UP/LT corresponds to detection times when the upper area is probed but the threat is in the lower area, and so on. This equation calculates the mean speed of detection latencies to probes in the same area as the threat stimuli by subtracting them from equivalent probe detection times when the threat is in a different location. It will result in a value of zero if the position of the threat stimuli exerts no differential influence upon the detection latencies for probes in either area. To the extent that any subjects attended selectively to the area where the threat stimuli appeared, thus detecting probes disproportionately rapidly in this area, the equation will result in a correspondingly large positive value. To the extent that subjects moved attention away from the area where this threat appeared, it will result in an appropriately large negative value" (MacLeod & Mathews, 1988, P, 664). These indices are shown in the Table 6.4.

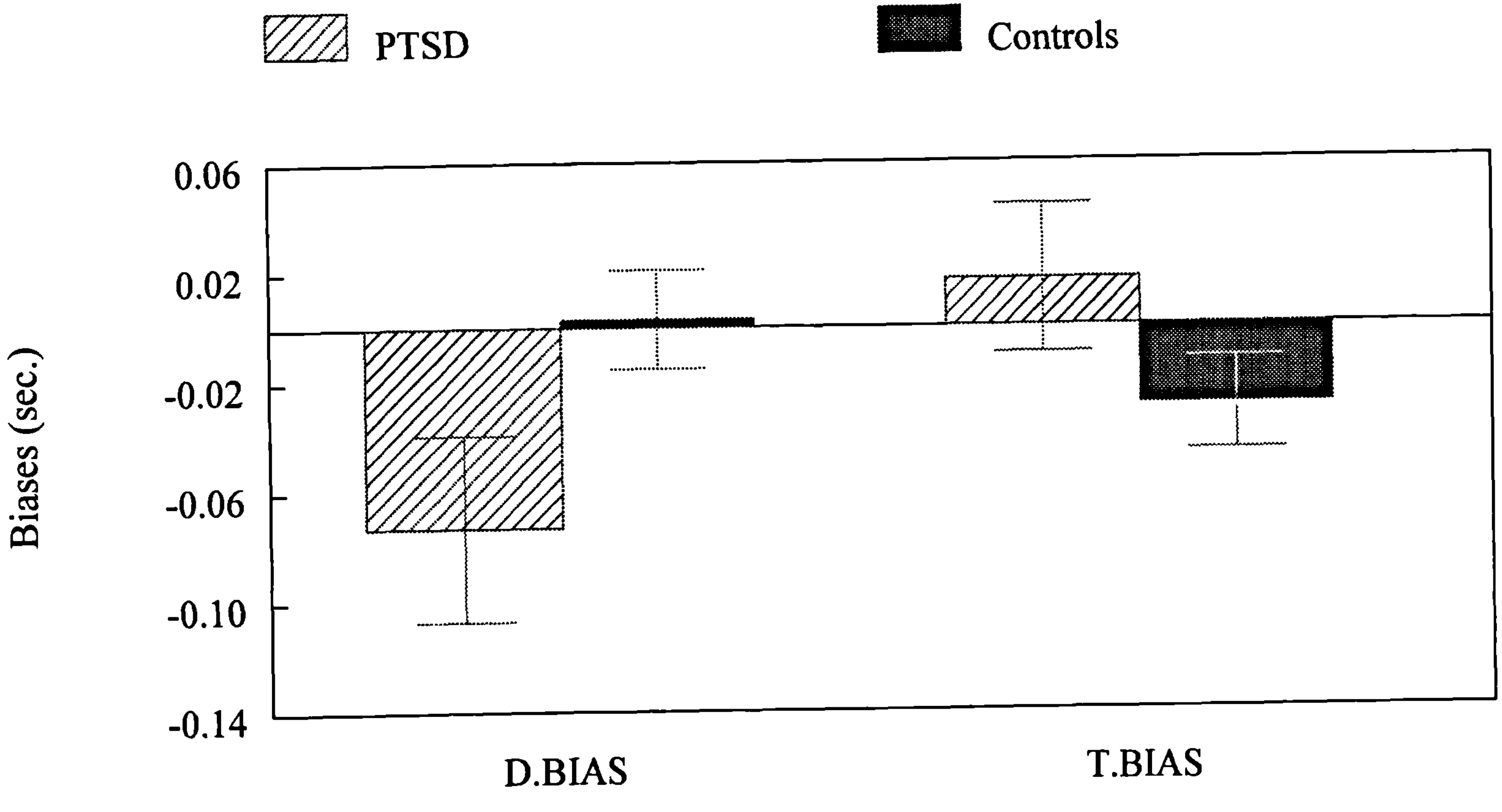
6.6.5.3. Analyses involving indices

To examine any emotional bias a full factorial ANOVA with repeated measures was conducted with one between-subjects variable (Group: control vs. patients) and as one within-subjects variable (Index Type: threat bias vs. depressed bias). The results showed no main effect of Group [$F(1, 46) = 0.47$, $P = 0.5$], but a significant interaction effect of Group X Index Type [$F(1, 46) = 5.09$, $P = 0.029$] was found.

To clarify this interaction two ANOVAs (threat vs. Depressed) were carried out across the two groups of subjects separately. The results revealed only a trend towards a significant effect of Index Type in PTSD patients [$F(1, 23) = 3.31$, $P = 0.082$] but not in controls [$F(1, 23) = 0.96$, $P = 0.34$]. These findings indicate that PTSD patients had a trend towards a bias towards threat words relative to depressed words. Figure 6.1 shows the differences between two groups for depression-related and threat words. See below for further deconstruction of these data.

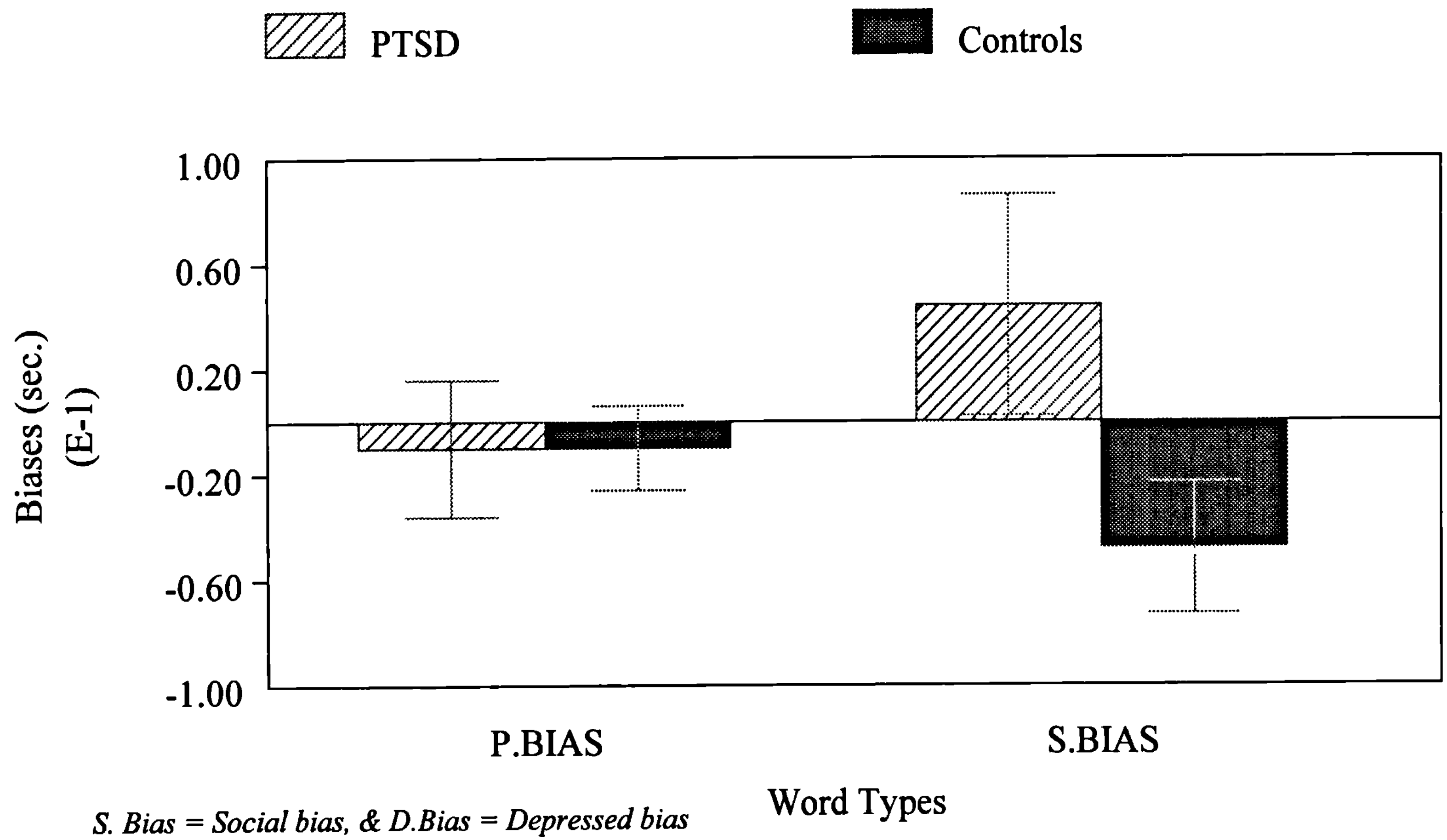
As previously mentioned the main purpose of the study was to examine attentional bias in a different way from the Stroop procedure. Three types of words which related to general threat (i.e. social and physical threat) and depression were used in different positions. It is already clear that the PTSD patients showed a trend towards a greater attentional bias towards general threat words (social threat +physical threat /2) than depressed words, but the question still remains, as to whether the selective attentional bias in young patients with PTSD is more affected by social threat or physical threat information. To clarify the effect of the two different types of threat word, a repeated measures ANOVA was conducted with Group (PTSD vs. control) X Word Type (social threat vs. physical threat). The results yielded a nearly significant interaction between Group and Word Type, [$F(1,47) = 3.36$, $p = 0.073$], but no main effect of Group or Word Type (Appendix 6.3) was found. Figure 6.2 shows differences between PTSD and controls for the two types of threat stimuli.

Figure 6.1: Differences on T.Bias & D. Bias across PTSD & Controls



D. Bias = Depressed bias, & T. Bias = Threat Bias

Figure 6.2: Differences on P.Bias & S. Bias across PTSD & Controls



S. Bias = Social bias, & D.Bias = Depressed bias

To deconstruct this near significant interaction two ANOVAs (social threat vs. physical threat words) were carried out for the two groups separately. The results showed that there were no differences between the two types of word in either group (Appendix 6.4).

To examine the near significant interaction further and to find the effect of each group of threat words vs. depressed words, two sets of ANOVAs were undertaken. The results of an ANOVA involving Group (PTSD patients vs. control) X Word Type (physical threat vs. depressed) yielded no main effect of Group nor Word Type (Appendix 6.5), but a marginal trend of Group X Word Type [$F(1, 46) = 3.33$, $P = 0.075$] was found. The results of a second ANOVA involving Group (PTSD vs. normal control) X Word Type (social threat vs. depressed) also revealed no main effect of Group, nor Word Type (Appendix 6.6), but a significant interaction was found [$F(1, 46) = 5.27$, $P = 0.026$].

To deconstruct these interactions a series of t-tests was carried out between three types of emotional words (i.e. physical threat, social threat, and depressed words) across PTSD patients and normal control subjects. The results indicated that there was not any significant difference on physical threat words between the two groups [df (46) = 0.01, P = 0.993], while a significant difference between the two groups on social threat material was found [df (46) = 1.89, P = 0.049]. A marginal difference in the opposite direction for depression-related words between the two groups was also found [df (46) = 1.43, P = 0.052]. These findings revealed that PTSD patients showed a bias towards social threat words relative to physical threat and depressed words.

6.6.5.4. Analyses of threat position and probe position

A full Factorial of ANOVA involving Group (PTSD vs. control) X Threat Position (upper area vs. lower area) X Probe Position (upper area vs. lower area) X Word Type (threat vs. depressed) was carried out. The results showed a strong main effect of Group [$F(1, 47) = 14.39$, $P = 0.0001$] and a four way interaction [$F(1, 46) = 5.06$, $P = 0.029$]but no other significant interactions or Word Type effect was found (Appendix 6.7).

To deconstruct this interaction two sets of ANOVAs involving Threat Position (upper area vs. lower area) X Probe Position (upper area vs. lower area) X Word Type (threat vs. depressed) were conducted separately across PTSD patients and normal control subjects. The results indicated only the predicted trend for three way interaction for PTSD patients [$F(1, 23) = 3.30$, $P = 0.082$]. Again, to examine this trend, two sets of ANOVA involving, Threat Position (upper area vs. lower area) X Probe Position (upper area vs. lower area) for two types of words (namely depression related and threat words) were carried out separately across PTSD patients. The results indicated an interaction only for depressed words [$F(1, 23) = 4.68$, $P = 0.041$] (Appendix 6.8). Finally, to test this interaction two paired-sample t-test were carried out to compare probe position and depressed word position. The results indicated a significant difference at the lower position (depressed word) for upper and lower probes and upper position (depressed word) for upper and lower probes [$t(23) = 2.20$, $P = 0.038$]. These results revealed that PTSD patients attended to shift attention away from depression-related words.

In sum, the analyses of the probe detection are complicated. However, the main findings are:

(1) Control subjects evidence no selective bias for either threat or depressed words.

(2) Relative to controls, PTSD subjects showed a small but significant bias in favour of social threat words and away from depression-related words.

(3) In absolute terms, PTSD patients show a bias away from depressed words.

6.6.5.5. Type of trauma effect

The next aspect which was examined was the effect of type of trauma on dot probe task performance. As seen in Chapter 5, there was no effect of trauma type on performance of a colour-naming task (Stroop task).

Means and standard deviations were calculated separately for each sub-group of patients i.e. road traffic accident (RTA) and personal violence (PV) victims on various measures of psychopathology (Table 6.5). One way ANOVAs showed that there were no significant differences between the sub-groups for verbal IQ, reading ability, anxiety, and Impact of Event Scale, Intrusion sub-scale of IES, and Avoidance sub-scale of IES scores

(Appendix 6.9) but, the PV group scored significantly higher on the measure of depression [F(1, 22) = 5.29, P = .031] compared to the RTA group. The PV group was also significantly older than the RTA group [F(1, 22) = 23.1, P = 0.001].

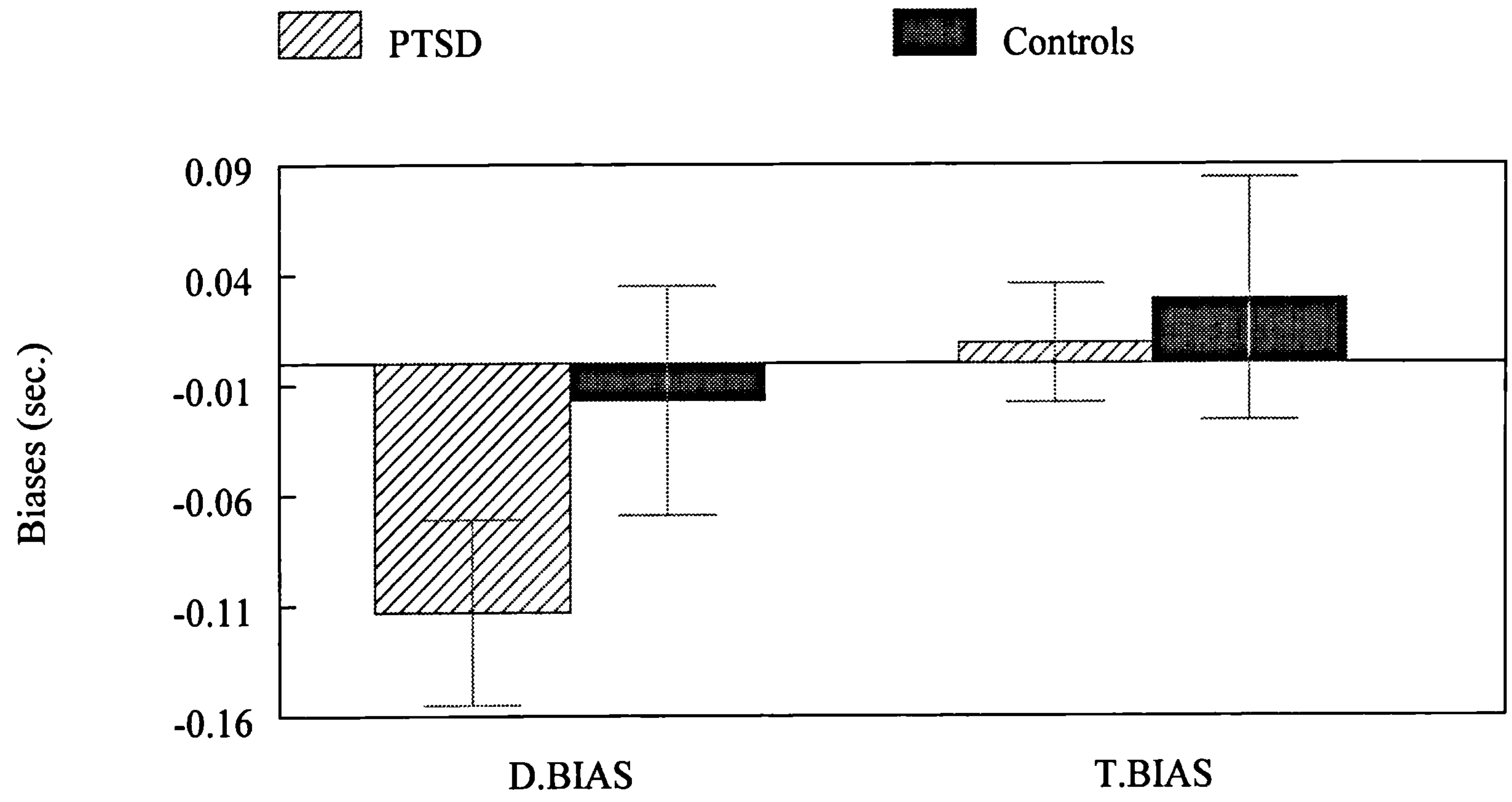
Table 6.5 Means and standard deviations (SD) of psychological measures for two sub-groups of PTSD i.e. RTA & PV

	RTA (N = 14)		PV (N = 10)		
	MEAN	SD	MEAN	SD	
AGE (months)	133.6	30.1	182.6	13.5	**
WORD	99.9	10.5	101.6	15.1	n.s.
BPVS	100.9	10.5	94.4	20.0	n.s.
DSRS	11.0	4.4	17.3	8.9	*
RCMAS	12.6	7.6	17.4	8.3	n.s.
IES	30.8	14.1	36.6	24.5	n.s.
AVOIDANCE	16.8	8.9	20.2	12.3	n.s.
INTRUSION	15.1	6.7	16.4	12.5	n.s.

IES = Revised Impact of Event Scale, RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary Scale, WORD (Basic Reading) = Wechsler Objective Reading Dimensions * = $P < 0.05$ & ** = $P < 0.01$

An ANOVA with repeated measures was carried out for Group (RTA vs. PV) X Word Type (Threat words vs. Depressed words). The results showed neither a main effect of Group nor interaction or Word Type effect (Appendix 6.10). These results revealed that both sub-groups of patients performed in the same way on the dot probe task. Figure 6.3 graphs the performance of the RTA and PV sub-groups of PTSD patients.

Figure 6.3: Differences on T.Bias & D. Bias across RTA & PV



D. Bias = Depressed & T.Bias = Threat bias

RTA = Road traffic accident, & PV = Personal violence

6.6.5.6. Preliminary developmental analyses

Is the selective attentional bias in young patients with PTSD affected by developmental aspects? To examine this point, as with the Stroop task (see Chapter 5) all subjects were divided into two groups, those below 13 years old and those over 13 years old. Subject characteristics and mean latencies of the types of bias for both groups of patients and controls are shown in Tables 6.6 and 6.8.

6.6.5.6.1. Children (under 13 years old)

One way ANOVAs showed that there were no significant differences between the two groups (aged under 13 years) on age, verbal IQ, reading ability, anxiety scores, or depression scores (Appendix 6.11).

Table 6.6 Means and standard deviations (SD) of psychological measures for PTSD and controls (aged under 13 years old)

	PTSD (N = 11)		NORMAL (N = 11)		
	MEAN	SD	MEAN	SD	
AGE (months)	119.40	17.83	133.33	18.64	n.s.
WORD	99.73	10.74	109.17	18.23	n.s.
BPVS	102.09	9.46	101.83	10.60	n.s.
DSRS	10.72	3.49	8.25	3.02	n.s.
RCMAS	12.27	6.51	11.58	4.46	n.s.

RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary Scale, WORD (Basic Reading) = Wechsler Objective Reading Dimensions

To study performance on the probe dot task in children (under 13 years old) index scores were computed as for the full sample and means of the biases for the two types of words were submitted to a two-way ANOVA of Group (PTSD patients vs. control subjects) X Index Type (threat words vs. depressed words). The results showed a significant interaction [$F(2, 20) = 9.76$, $P = 0.005$] while neither a main effect of Group, nor Index Type (Appendix 6.12) was found. Table 6.7 shows means and standard deviations of biases for children with PTSD and normal control subjects under 13 years old.

Table 6.7 Means and standard deviations (SD) of biases in sec. for PTSD & control (aged under 13 years) (threat bias = social bias + physical bias / 2)

	Social Bias	Physical Bias	Depressed Bias	Threat Bias
PTSD	0.037	-0.012	-0.146	0.012
SD	0.168	0.165	0.168	0.114
CONTROLS	-0.050	-0.013	0.016	-0.032
SD	0.161	0.046	0.114	0.093

To clarify the interaction, two sets of ANOVAs were undertaken across the two groups separately. The results indicated a significant difference between threat and depressed information in the younger PTSD group [$F(1, 10) = 10.11$, $P = 0.01$], while a significant difference was not found on control subjects [$F(1, 20) = 3.94$, $P = 0.61$]. This result indicated that younger children with PTSD showed selective attentional bias for threat words, relative to depressed words as with the full sample.

6.6.5.6.2. Adolescents (over 13 years old)

One way ANOVAs indicated that there were no significant differences between the two groups (aged over 13 years) on age, verbal IQ, and reading ability (Appendix 6.13), but significant differences on anxiety scores [$F(1, 22) = 5.63$, $P = 0.027$], and depression scores [$F(1, 22) = 5.96$, $P = 0.024$] were found. Tables 6.8 and 6.9 show means and standard deviations of psychological measures and bias scores for adolescents.

Table 6.8 Means and standard deviations (SD) of psychological measures for PTSD and controls (aged over 13 years old)

	PTSD (N = 12)		NORMAL (N = 11)		
	MEAN	SD	MEAN	SD	
AGE (months)	180.42	11.88	172.36	9.78	n.s.
WORD	101.31	13.96	98.75	15.24	n.s.
BPVS	94.84	18.44	92.58	18.18	n.s.
DSRS	16.08	8.66	8.50	3.40	**
RCMAS	16.62	8.96	9.25	3.62	**

RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary Scale, WORD (Basic Reading) = Wechsler Objective Reading Dimensions. * = P < 0.01; ** P = <0.001

A repeated measures ANOVA of Group (PTSD vs. control subjects) X Word Type (threat words vs. depressed words) was carried out. The results showed no main effects nor interaction (Appendix 6.14).

Table 6.9 Mean and standard deviations (SD) of biases in sec. for PTSD and controls (aged over 13 years) (Threat bias = social bias + physical bias / 2)

	Socials Bias	Physical Bias	Depressed Bias	Threat Bias
PTSD	0.053	-0.010	-0.012	0.021
SD	0.250	0.910	0.150	0.158
CONTROLS	-0.032	-0.012	0.002	-0.022
SD	0.068	0.104	0.053	0.073

6.6.5.7. Sex effect

To examine sex effects, PTSD subjects were divided into two groups: boys and girls. Subject characteristics for both groups of patient are shown in Table 6.10.

Table 6.10 Means and standard deviations (SD) of psychological measures for boys and girls with PTSD

	BOYS (N = 12)		GIRLS (N = 12)		
	MEAN	SD	MEAN	SD	
AGE (months)	154.08	35.24	153.92	35.38	n.s.
WORD	95.91	14.05	105.67	7.28	*
BPVS	98.08	15.31	98.25	15.69	n.s.
DSRS	12.58	5.11	14.67	8.95	n.s.
RCMS	12.25	7.60	17.00	8.16	n.s.
IES	26.82	17.14	39.33	19.38	n.s.
AVOIDANCE	14.09	8.70	22.64	10.75	*
INTRUSION	12.73	9.51	18.64	9.08	n.s.

IES = Revised Impact of Event Scale including Avoidance and Intrusion Subscales, RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary Scale, WORD (Basic Reading) = Wechsler Objective Reading Dimensions. * = $P < 0.1$

One way ANOVAs showed that there were no significant differences between boys and girls on age, verbal IQ, depression scale, anxiety scale, Impact of Event Scale total scores, or Intrusion subscale scores (Appendix 6.15), but the results indicated a marginally significant difference on the avoidance sub-scale of the IES [$F(1, 20) = 4.2$, $p = .054$], and a trend was also found on reading ability [$F(1, 23) = 3.85$, $P = .062$], with girls obtaining higher scores on the avoidance subscale and on the Basic Reading Scale compared with boys. Bias scores for boys and girls with PTSD were calculated as for the full sample and the means are shown in Table 6.11.

Table 6.11 Means and standard deviations (SD) of biases in sec. for boys and girls with PTSD (threat bias = social bias + physical bias / 2)

	Socials Bias	Physical Bias	Depressed Bias	Threat Bias
BOYS	0.014	0.003	-0.084	0.008
SD	0.273	0.92	0.179	0.169
GIRLS	0.074	-0.022	-0.062	0.026
SD	0.107	0.155	0.158	0.088

To examine any sex effect, an ANOVA with repeated measures was performed of Group (PTSD boys vs. PTSD girls) X Word Type (threat bias vs. depressed bias). The results revealed no main effects or interaction (Appendix 6-16). Therefore, as with the Stroop task, both sub-groups performed in the same way on the attentional deployment task.

6.6.5.8. Correlational analyses

Tables 6.12 and 6.13 show the correlational analyses between psychological variables and biases across all subjects and for PTSD patients only, respectively. Correlational analysis showed that there is a significant negative correlation between reading ability and threat bias and trends for the other types of bias. This means that high scores on the Basic Reading Scale relate to shorter reaction times to respond to probes. There is also a positive significant correlation between depressed bias and age. In other words, younger subjects shifted away more from depressed-related words relative to older subjects. Significant correlations between different types of biases (i.e. physical bias, social bias, depressed bias or threat bias) and other psychological measures across all subjects were not found. Correlational analysis with the PTSD subjects only indicated a marginal relationship between total and intrusion sub-scale scores of the Impact of Event Scale (IES) and depressed bias. Further correlational analyses revealed that age and the total score of the IES did not correlate with each other for all PTSD patients [r = 0.30, P = 0.16], but a marginally positive correlation beween age and IES was found for girls with PTSD [r = 0.54, P = 0.069].

Table 6.12 Correlations between psychological measures and biases across all subjects i.e. PTSD patients and normal controls (N = 48)

	Threat	Social Threat	Physical Threat	Depressed
Age	0.20	0.12	0.23	0.31
P	0.18	0.43	0.11	0.03**
BPVS	-0.17	-0.13	-0.16	0.08
P	0.24	0.38	0.28	0.58
DSRS	0.16	0.16	0.07	0.05
P	0.29	0.28	0.61	0.75
RCMAS	0.14	0.06	0.20	0.18
P	0.34	0.67	0.17	0.21
WORD	-0.32	-0.27	-0.24	0.25
P	0.03**	0.07*	0.1*	0.08*

RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary Scale, WORD (Basic Reading) = Wechsler Objective Reading Dimensions.

Table 6.13 Correlations between IES & Biases of emotional words across PTSD patients (N = 24)

	Threat	Social Threat	Physical Threat	Depressed
IES	-0.20	-0.28	0.037	0.38
P	0.36	0.19	0.86	0.07*
AVOIDANCE	-0.18	-0.22	-0.03	0.32
P	0.42	0.33	0.91	0.14
INTRUSION	-0.30	-0.28	-0.24	0.38
P	0.18	0.20	0.29	0.08*

IES = Impact of Event Scale including intrusion and avoidance items; Threat Bias = (Physical Bias + Social Bias)/2 * = P < 0.1 & ** = P < 0.05

6.6.6. Discussion

The main aim behind the current research was to study attentional bias in young people with PTSD using the attentional probe dot task. It was expected that PTSD patients should shift their attention towards any threatening material relative to controls, but show no bias for depression-related information.

In summary, the results of this research indicated that PTSD patients showed an attentional bias towards threat words (physical threat + social threat/2) relative to controls, while they shift away from depression-related material. Further analysis revealed that this bias referred to social threat information rather than phsical threat material. In addition, analysis for the PTSD group alone, revealed an absolute bias away from depression words in this group. Both sub-groups of PTSD (namely, RTA & PV) performed on the same way in attentional probe dot task. Regarding sex effect, no difference on the performance of attention was found. While younger children with PTSD showed a bias towards threat stimuli relative to depression stimuli, older PTSD patients exhbited no bias for any particular material. Correlational analysis showed support for this age effect with a significant negative correlation between age and bias towards depressed words. Correlations also revealed a consistent relationship between reading ability and any form of bias which is not surprising as the task involved reading. The one puzzling correlation was a positive relationship between IES scores and depression bias in the PTSD subjects. This means that, although as a group PTSD subjects evidenced a bias away from depressed words, within the group the extent of this bias was lower as the subjects were more symptomatic on the IES.

The current study supports the original hypothesis that PTSD patients as a subgroup of anxiety disorders exhibit a bias in selective attention that favours the pick up of emotionally threatening information thought it seems to be confined to social threat, and to younger subjects. Although PTSD patients were significantly more depressed than controls, they actually showed a significant attentional bias away from depression-related words.

Although, the bias in favour of threat seems to be a consistent finding, there remain some puzzling questions: (1) why is this bias restricted only to social threat and not to physical threat? (2) why is there a bias away from depressed words in PTSD patients despite their high levels of depression? and (3) why despite this bias away, is there a marginally significant positive correlation within the PTSD patients between IES scores and depression bias?

Regarding the first question, differences between physical and social threat words have generally not been studied, because the subjects have not been divided according to their primary concerns (e.g. MacLeod et al., 1986). In the current study, the differences between social threat and physical threat may be explained by the fact that PTSD patients may have been highly selected on the basis of their defence against social threat. If PTSD patients are more sensitive and alert to stimlui which are interpreted as threatening cues, then, in this case, they might interpret social information as more threatening than physical. This interpretation lead the patients toward a processing bias for social threat information. As noted earlier, trauma-related words were not used in this study, and it seems likely that the performance of PTSD patients was affected by this point. One might predict that PTSD patients would show a bias favouring trauma-related material than threat words as was observed in the Stroop task with five catergories of words (i.e. threat, happy, depressed, neutral, and trauma-related, see Chapter 5).

In terms of the second question, generally, depressed subjects fail to show an attention shift towards any types of negative material including threat or depressed information. As Mathews and MacLeod (1994) concluded, attentional probe tasks have yielded less consistent support for the hypothesis that depression would be associated with a bias towards negative emotional material (see the literature review in this chapter and in Chapter 5). However, although PTSD patients scored high on levels of depression relative to controls, PTSD patients were also more anxious than controls. Therefore, it seems possible that the effects of anxiety overwhelmed any weak influences of depression.

Finally, regarding the third question about a marginal correlation between IES scores and depressed bias which goes against the group findings,it seems that within traumatised subjects, higher levels of trauma lead to selective bias in favour of all negative information. However, across all subjects, both traumatised and controls, differences with respect to whether material is depressive or anxiogenic arise.

It seems that the findings of this study with PTSD patients as a sub-group of anxiety disorders are broadly in agreement with those of MacLeod, Mathews and Tata (1986) who found that adult normal controls tended to shift attention away from threatening stimuli, while anxious patients tended to shift towards threatening material.

These results are also consistent with other findings using the Stroop paradigm with PTSD patients (e.g. Trandel & McNally, 1987; McNally et al., 1990; McCarthy et al., 1990; Ehlers et al., 1988; Foa et al., 1991; Foa et al., 1991; and Thrasher et al., 1994) of an attention bias for threat and with results of the Stroop task reported in Chapter 5.

These findings also are broadly in agreement with those using child subjects with other anxiety disorders and depression (Vasey et al. 1995, & Vasey et al., 1994; Taghavi et al., in preparation) which show a clear attentional bias toward emotionally threatening cues in anxious subjects but not in depressed individuals. Vasey et al. also found an attentional bias away from emotionally-threatening stimuli among low-test-anxious children, but only among boy subjects.

In sum, the results of this study and other existing research with children (Taghavi et al.in preparation, with anxious and depressed children and adolescents;Vasey et al. 1995, with clinically anxious children; Vasey et al. 1995, with nonclinically anxious children) support the affect-congruent effect hypothesis (Beck & Emery 1985) and the predictions from network theory (Bower, 1981 & 1987) and the Williams et al. (1988) model and suggest that these can be usefully applied to young people with emotional disorders. The findings show that a modified probe dot task with suitably selected trauma-related words would probably be a good task for future investigation of cognitive processing biases in children with PTSD.

CHAPTER 7

RECALL AND RECOGNITION MEMORY PERFORMANCE IN CHILDREN AND ADOLESCENTS WITH POST-TRAUMATIC STRESS DISORDER

7.1. Introduction

Cognitive processes in emotional disorders can be investigated using self-report techniques. Such approaches, however, suffer from problems of interpretation such as response bias. There has, therefore, been increasing interest in the application of experimental cognitive paradigms including information processing paradigms and memory tasks (recall & recognition) to examine differences in how people with emotional disorders such as anxiety and depressive disorders process material relevant to their disorder. Much of this interest has stemmed from the theoretical work of Beck (e.g., Beck & Emery, 1985; Beck & Clark, 1988). Beck has debated that the thought processes of individuals who become clinically anxious are characterised by certain schema related to personal vulnerability and danger. It is assumed that these schema remain latent until activated by appropriate environmental events (e.g., stressful life events). When these schema are activated, then they influence the processing of threat-related information via attention, comprehension and retrieval. Beck has focused on structural aspects of emotion, danger and vulnerability schemas possessed by anxious patients that only become active in stressful conditions, meaning that state anxiety is also relevant in the production of affect-congruent effects (for more details see Chapter 3).

Another theoretical framework related to this area has been proposed by Bower (1981, 1987) as a network model. According to this model, information in long-term memory is stored as nodes in a network, and nodes that are related to each other are connected together. Information is accessed within the network by activation of the appropriate node. When a given node is activated, activation spreads from that node to other nodes connected to it, making them more available in the cognitive system. A key assumption is that each emotional state is represented by a node within the semantic network. When an emotional state is experienced, this produces activation of the corresponding emotion node. This then leads to activation of related nodes, most of which contain affect-congruent information. As a consequence, someone in an anxious mood state should show superior processing of anxiety-relevant stimuli compared with non-relevant stimuli across a wide range of perceptual, attention, and memory tasks (see Chapter 3).

Beck and Bower differ in terms of how processing is involved in producing affect-congruent effects. According to Beck, these effects stem primarily from top-down processes initiating relevant schema, whereas Bower emphasises bottom-up processes based on priming of nodes. In sum, both theorists predict that anxious individuals should exhibit superior long-term memory over non-anxious individuals for information that is relevant to anxiety. Therefore, according to Beck's and Bower's theories, anxious subjects should show a bias in memory tasks for threat-related information.

Williams et al.'s model (1988) postulates that anxious patients have problems in the encoding stage (early stage) of processing while depressive patients show problems in the retrieval or late stages of processing. Memory tasks are related to retrieval or late stages of information processing; therefore, anxious patients should not show a memory bias towards threat-related stimuli, whereas depressed patients should show a memory bias towards depression-related material.

In the last decade investigators have attempted to apply the above cognitive models of information processing to address the issue of memory for trauma-related information in PTSD (Foa et al., 1987; Janoff-Bulman, 1985, 1992; Chemtob et al., 1988; Creamer et al., 1992; Dalgleish & Power, 1995 see Chapter 3 for a detailed review). While most of these theories have been inspired by the main cognitive approaches (Lang, 1977, 1985; Bower, 1980, 1982; Beck & Emery, 1985; Williams et al, 1988), they need support from experimental evidence. Little research has been done on patients with PTSD using experimental cognitive paradigms, and there are no published papers with children with PTSD as subjects.

7.2. Memory bias in adults with anxiety

As previously mentioned, experimental studies try to investigate information processing (such as attention and memory) in adults with emotional disorders. Most of the studies of memory bias were conducted with anxious and depressed subjects. There are two main differences in memory bias studies between anxiety and depression. The first is reflected in the methodology or design. The majority of studies on anxiety have used correlational designs while, in most studies with depressed subjects, group designs have been used. Although both designs are statistically acceptable, the correlational design tends to be less sensitive. Secondly, the majority of anxiety studies have been carried out with students, while more depression studies were conducted with clinically depressed patients; therefore, these factors should be borne in mind when interpreting the results (Watts, 1995). However, studies on memory bias with anxious subjects have revealed equivocal results. Some studies have shown a memory bias for threat, particularly an implicit memory bias, in anxious subjects, whereas some others have not. Studies with depressed subjects have indicated a strong memory bias (explicit memory) or poor memory towards negative cues compared with control subjects (Ellis, et al., 1984; Watts & Sharrock, 1987; Mogg et. al., 1994).

Mogg et al. (1987) presented anxious and control subjects with the standard self-referent task, with a mixture of positive, threatening-negative, and non-threatening negative adjectives. On subsequent unexpected tests of recall and recognition, the anxious subjects showed poor memory for threat material relative to controls, though this was not significant. There were no differences between performance on self-referent and other referent words.

To study memory bias (implicit and explicit) in anxious people, Mathews, Mogg, May and Eysenck (1989) selected three groups of subjects (18 in each group): generalised anxiety, recovered from anxiety, and control. They were presented with a list of neutral, positive, and threatening words, and were asked to perform a self-reference encoding task, and then complete cued recall and word completion tests, given in balanced order. The materials included a pool of 96 stimulus words, 48 emotional words including physical and social threat and 48 unrelated threat words including neutral and positive. The 24 words in each threatening and non-threatening condition were subdivided into three parallel sets which were matched for frequency and available stem completions. Words were presented in a fixed order, each word was presented in turn for 10 seconds, and subjects were asked to press a response button during that period when they had to think about a scene. For the cued recall test, subjects were presented with a copy of the appropriate response form and were told that the three-letter stems printed on the sheet were the beginnings of some of the words that had been presented in the "imagination task". They were asked to try to remember the words beginning with the three letter stems and to write them down. For the word completion task (implicit memory) subjects were asked to write down the first word that came into their mind beginning with the letters printed on the sheet as quickly as possible. The results revealed that performance on the explicit test were correlated with trait anxiety scores, but there were not clear significant differences among the three groups of subjects. Anxious subjects produced more threat word completions, which confirmed the prediction. To summarise, the results of this study showed that implicit and explicit memory biases for threat information are essentially independent of one another, and that, whereas explicit memory bias was correlated at a low level with variations in trait anxiety, the clinical groups differed significantly only in implicit memory for threat cues.

Mogg et al. (1992) established a study to test two hypotheses. First, to obtain more definitive evidence on the question of whether or not there is a recognition memory bias for or against threat words in anxious patients. Second, if no bias was found, the "trade off" hypothesis was tested by assessing "know" and "remember" responses. These responses were introduced by Tulving (1985) to measure two kind of awareness. A "remember" response indicates that recognition of the word is accompanied by some specific recollective experience of the prior occurrence of the word in the study list. A "know" response indicates that recognition is not accompanied by any such recollective experience, but that it is based instead on a feeling of familiarity. This was the most important difference between this study and previous ones. They selected 24 generalised anxiety and 24 control subjects. Study list words were presented on a deck of cards in a new random order for each subject. The subjects were told to attend carefully to each word because there would be a memory test for the words later in the session. For the recognition task, the subjects were told to draw a circle around each word that they recognised from the study cards; they were also to write an "R" for "remember" if their recognition was accompanied by a conscious recollection of its prior occurrence in the study list, or a "K" for "known" if they did not consciously recollect the word's occurrence in the study list but recognised it on some other basis. The results failed to confirm that anxiety is associated with an implicit memory bias towards threat words. There was a significant difference between the two groups on "remember" responses which supports the hypothesis that anxiety is associated with cognitive bias favouring threat which operates primarily in conceptual, rather than other types of implicit memory such as the perceptual system.

Eysenck and Byrne (1994) selected 40 student subjects aged 18 to 35 years. They were divided into 3 groups on the basis of their scores on a state-trait anxiety scale. The task consisted of 160 words, half of the words were emotionally threatening and half were neutral. All words were rated for emotional and threat value by members of staff and postgraduate students. The stimulus words were matched for word frequency and each word had a unique three-letter stem which matched with the number of non-pool words sharing the stem. There were three different memory tests; word completion, cued recall and free recall which were presented to the subjects by computer. Subjects were told that they would be presented with a series of words in two different conditions. In some cases a single word would be presented while, in other cases, they would see a short phrase describing a word and the first letter of the word that subjects were required to say aloud. The experiment was conducted in three stages for word completion, cued recall and free recall tasks. The results indicated the existence of negative memory biases in the high trait-anxious group.

MacLeod and McLaughlin (1995) recruited 16 anxious patients (generalised anxiety disorder) and 16 control subjects to participate in memory (explicit and implicit) tasks. The subjects were presented with threatening and non threatening words in a colour-naming task. They were instructed to name the ink colour and to say the word itself. After the encoding task, explicit and implicit memory were tested. Each subject was required to perform four different types of tasks during the test session. First, the subject was given a set of exposure calibration trials, to determine the exposure duration. Second, the subject was exposed to one of the presentation word sets in a colour-naming encoding task. Third, the subject was given a memory task including explicit and implicit memory tests. The results provide clear support for the authors' experimental predictions; i.e. the anxiety patients showed a relative implicit memory bias for threat words, while the two subject groups did not reveal differences on the explicit memory test.

The findings on negative memory bias in sub-clinically anxious subjects have been more complicated. In essence, high trait anxious normals sometimes exhibit an explicit negative memory bias and they may also display an implicit negative memory bias (Eysenk & Mogg, 1993), in contrast to anxious patients who do not appear to have an explicit memory bias, but with indications that they possess an implicit memory bias. According to Beck's and Bower's theories, the anxious subjects should exhibit both an implicit and explicit negative memory bias. However, the results of research has failed to unequivocally support these theories.

An alternative approach was proposed by Williams, Watts, MacLeod and Mathews (1988) to interpret these equivocal results. This approach assumes that the encoding of threat-related and neutral information involves at least two major processes: relatively automatic or basic processes occurring at a preattentive level, and more controlled processes involving elaborate encoding of the personal stimulus. Automatic processing will have a greater influence on threat-related stimuli in anxious subjects than non-anxious groups. Moreover, it seems that clinically anxious patients may have developed avoidance strategies that restrict the elaboration of processing, because of the highly aversive effects of continued processing of the threat material.

In summary, the findings with clinically anxious adult subjects indicate a memory bias for threat on implicit memory, while in most research with explicit memory tasks they did not show such a memory bias.

7.3. Memory biases in adults with depression

A considerable body of evidence shows that depressed subjects complain more about their memory performance related to their mood or emotional state than is refelected on their objective performance on memory tests (Watts 1995). However, many researchers have shown that depression produces a general memory impairment (e.g. Ellis et al., 1984; Watts & Sharrock, 1987). Furthermore, the research literature on mood congruent memory with depressed and non-depressed subjects shows a memory bias for positive material for non depressed subjects and a bias towards negative cues for depressed subjects. There is also evidence (Watts, Morris & MacLeod, 1987) that depressed patients are impaired even on recognition memory.

Depression memory problems are generally thought to be associated with long-term memory and performance on short-term memory tasks is regarded as intact. For example, Cohen et al. (1982) found that depressed patients were impaired only on a delayed recall task. However, like amnesic patients, depressed subjects indicate biases in explicit memory tasks (such as recall and recognition) rather than implicit tasks, while anxious subjects mostly show biases in implicit memory. However, one study (Elliott & Greene, 1992) found that depressed subjects revealed biases on both explicit and implicit tasks.

The literature on memory functions in depression is very extensive. The investigators have researched memory performance with clinical, sub-clinical and normal subjects who have received some form of mood induction. Here, I will review only a selected body of research which illustrates memory functions in depressed individuals.

Bellew and Hill (1990) studied recall of positive and negative emotional nouns by sub-clinically depressed and non-depressed groups. The experiment included two main parts. In part 1 the subjects were presented with 15 simple negative nouns (not considered to threaten self-esteem) and 15 emotionally positive nouns. Subjects were asked to read each word aloud and imagine the experience it conveyed. In part 2, 15 nouns related to threat to self-esteem and 15 emotionally positive nouns were presented to the subjects who were divided into two groups, those who had shown a depressive recall bias in part 1 and those who had failed to show the depressive recall bias in part 1, to study susceptibility to induced depressive mood. The results indicated that the depressed group showed better recall than the non-depressed group for self-esteem threat words. Depressed subjects also showed a greater bias towards negative words than positive words related to self. This experiment also showed that subclinical depression was not associated with a bias towards better recall of negative material and normal mood was not associated with better recall of simple positive words.

Bradley and Mathews (1988) recruited 9 major depressed, 11 recovered depressed and 12 non-psychiatric controls to investigate memory bias for negative and positive adjectives. Three sets of words (8 positive and 8 negative adjectives in each set) in two conditions (self and unfamiliar) were presented. In each presentation, subjects were required to decide whether the word described themselves or an unfamiliar other person. After each list there was a 20 sec. interference task followed by 2 mins. free recall. Results showed that depressed subjects exhibited a negative self-referent bias in recall while the recovered group and the controls recalled more positive than negative self-referent material. There was no difference between the three groups on rating words about the unfamiliar other person.This finding is consistent with those that suggest that depressed memory effects can be entirely explained by current mood state (e.g. Bellew & Hill, 1990).

Watkins, Mathews, Williams, and Fuller (1992) compared the performance of depressed subjects and normal controls on implicit and explicit tasks. The task included depressed-related, neutral positive, and physical threat words. All subjects participated in an encoding task and a memory task. Following the practice words, subjects were presented with 64 experimental words. This was followed by a distractor task. Finally, the subjects performed the two memory tasks; cued recall and word completion. The results revealed a mood-congruent memory bias in the explicit memory (cued recall) task but not in the implicit memory (word completion) task. In addition, depressed subjects showed a memory bias towards depressed related words but not towards physical threat words. The authors concluded that these findings suggest that the mechanism for the explicit memory bias in depression is elaboration.

Bradley, Mogg, and Williams (1994) compared the performance of non-clinical, high negative-affect and low negative-affect subjects on implicit and explicit memory. Five categories of words (depression, anxiety, positive, categorised neutral and uncategorised neutral) were used in this study. The implicit memory test was primed lexical decision (i.e. deciding if a stimulus is a word or non-word). Two types of priming were examined: supraliminal and subliminal. The measure of priming was the extent to which the lexical decisions are faster due to previous exposure to the words. The explicit memory test was an incidental free recall task. In the recall test all types of words except uncategorised neutral words were used. The results showed that the high negative-affect group revealed greater subliminal priming of depression-relevant than neutral control words. This selective priming effect was more closely associated with depression than anxiety measures. There were no significant differences between the high negative-affect group and the low negative-affect group on the supraliminally primed lexical decision and free recall tasks. However when state and trait anxiety were controlled together in correlational analysis , Beck Depression Inventory (BDI) scores significantly correlated with the depression word bias measure. On the other hand, when BDI scores were partialled out, the depression word recall index did not positively correlate with either state or trait anxiety. The results of this study seems to be inconsistent with the theories of Beck (e.g. 1976), Bower (e.g. 1981), and Williams et al. (1988).

Denny and Hunt (1992) conducted a study on affective valence and memory in depression. They compared the results of 16 depressed female patients and 16 non-depressed women on a free recall (explicit) and word fragment completion (implicit) test. They used 12 positive and 12 negative valence words. Recall level was significantly higher for the non-depressed group than for the depressed group. Under free-recall instructions, depressed subjects recalled significantly more negative words than positive words, whereas nondepressed control subjects recalled more positive than negative words. Finally, comparisons revealed a significant between-groups difference in the recall of positive words, but not negative words. The data from the word fragment completion test (implicit memory) revealed no differences between groups or subjects. The findings of this research indicated a strong explicit memory bias in subjects with depression, which supports Williams et al's (1988) theory about elaborative or controlled processing in depression.

Elliott and Greene (1992) compared the performance of 10 depressed patients with 10 normal controls on implicit and explicit memory. In the first phase of their study, subjects were presented with a list of 86 six-letter words printed on cards (one word per card). The first and last three words were buffer words that were not tested. The first three letters of each word were also the first three letters of at least 10 other words listed in a standard thesaurus. Subjects were instructed to listen as each word was presented. They then received the word stem completion task. Next, subjects received the cued-recall task. In the second phase, 50 word pairs, 32 consisting of a priming word and a homophone and 18 consisting of non-homophone buffer items were presented. Subjects were asked to remember the second member of each word pair. A spelling test on the 32 homophones then followed, presented on cassette tape. Then, subjects were asked to write down all the words they could remember from the list. Results showed that, compared with the control group, the depressed group had impairment on the explicit memory tasks (cued-recall, and free recall) and on the implicit memory tasks (word completion, and spelling).

Bradley, Mogg, Galbraith and Perrett (1993) studied the incidental recall of 15 positive and 15 negative trait adjectives in 21 high and 18 low Neuroticism (N) subjects in whom depressed or neutral mood had been induced. The words were presented in random order on audiotape and the subjects were asked to rate how well each word described them using a 5 point scale. Results showed that the negative recall bias was an interactive function of trait vulnerability (as reflected by N scores) and current mood state. In the depressed mood condition, there was a trend for high Neuroticism to be associated with relatively better recall of negative material. However, in neutral mood, high level of

Neuroticism predicted relatively poorer recall of negative information.

In summary, depression is associated with facilitated explicit memory biases for negative cues. In most of the studies (and only a selection have been reviewed here) Williams et al.'s (1988) prediction that depressed patients would show an explicit memory bias and no implicit memory bias was supported. Such findings are also in line with the predictions of Beck (e.g. 1976) and Bower (e.g. 1981).

7.4. Memory performance in adults with PTSD

There are only a few published studies on memory performance in adult patients with PTSD by Zeitlin & McNally (1991) and McNally et al. (1994; 1995), who studied explicit (cued recall) and implicit (word completion) memory and autobiographical memory disturbance.

Zeitlin and McNally (1991) selected 24 Vietnam combat veterans with PTSD and 24 Vietnam combat veterans without PTSD to study explicit and implicit memory bias. The material consisted of 4 types of words, 24 combat, 24 social threat, 24 positive and 24 neutral words which were matched for length. Each word had a unique three-letter stem within the word set, but for each word there was at least one other word which had the same three-letter stem and a higher word frequency, which was not presented to the subjects. The words were individually presented to the subjects on index cards. They used three parallel word sets for three versions of the memory task including word completion, and cued recall. To do the encoding task, half of the PTSD and half of the control subjects were randomly divided into either an elaborative or a nonelaborative encoding condition. Following the encoding task, subjects performed a distractor task which was counting backwards from 300 by 3s for 2 min. Subjects then performed either the word completion or the cued recall memory test. For the word completion test, subjects were asked to write down the first word that came to their mind, except proper nouns, beginning with the three letter stems printed on the form. For the cued recall test (explicit memory) subjects were asked to complete each stem by recalling the words and writing down the missing letters.

The results indicated that on the cued recall test, both groups recalled more combat words than other words. Tests for simple main effects of group showed no significant difference between the two groups on the recall of combat or social threat words, but control subjects recalled more positive and neutral words. The data indicated that PTSD patients have generally poor explicit memory. However, difference scores obtained by subtracting the mean recall for neutral words from the mean recall scores for the other words revealed that PTSD patients exhibited a relative (not an absolute) explicit memory bias for combat words. In total, PTSD patients tended to exhibit poor memory for everything but combat words. On the word completion test, only PTSD subjects exhibited an implicit memory bias for combat words. These results replicated those of Mathews et al. (1989) who reported an implicit memory bias for threat in GAD patients.

McNally et al. (1994) recruited three groups of subjects, 39 male Vietnam combat veterans with PTSD, 20 male Vietnam combat veterans as a non-PTSD psychiatric control group and 23 male Vietnam combat veterans as a well-adjusted control group. All groups were randomly assigned to either the combat prime condition or the neutral prime condition. The subjects were presented with two videotapes; one involving scenes from the Vietnam war (combat prime), and the other involving furniture (neutral prime), each one lasted around 5-6 minutes. Each comprised 20 colour photographs. Cue words were 10 positive, 10 negative and 10 neutral words which were typed separately on a card. Subjects completed the Visual Analogue Mood Scale (VAMS) which provided measures of mood before and after the priming manipulation. The experimenter presented the experimental words to the subjects one at a time and asked them to retrieve the first specific personal memory that come in to their mind. All sessions were audio taped. The results indicated that PTSD patients experienced difficulty retrieving specific autobiographical memories, especially after having viewed the combat videotape. PTSD subjects also retrieved more memories related to Vietnam than did other psychiatric patients, but not more than the well-adjusted group. In summary, the findings of this study are consistent with those of Williams and Dritschel (1988) with patients who had recently attempted suicide.

McNally et al. (1995) used an autobiographical cueing paradigm to study self-representation in PTSD. They asked Vietnam combat veterans with and without PTSD to derive a specific personal memory in response to trait adjectives having either positive or negative valence. Nineteen Vietnam combat veterans with PTSD and 13 Vietnam combat veterans without PTSD participated in this study. The task comprised 10 positive and 10 negative cue words. Each word was the name of a trait or personal characteristic which was printed on a separate card. The experimenter presented each word to the subjects, read it aloud, began timing, stopped the stopwatch once, asked the subjects to think of a time and retrieve a specific memory, and then asked the subjects to date the episode. A specific memory was defined as a discrete episode, lasting no longer than a single day, that happened to the subject (e.g. Pillemer, Rhinehart & White, 1986; Williams & Dritschel, 1988). The results indicated that PTSD subjects retrieved specific memories less than controls and this was exactly the same for both positive and negative cues, whereas control subjects were significantly more specific in response to positive cues than to negative cues. Control subjects also were faster at retrieving a specific positive memory than were PTSD subjects, while the two groups did not differ in latency to retrieve specific positive memory cues. These findings were consistent with McNally et al.'s previous research which found that PTSD subjects indicated greater difficulty retrieving specific autobiographical memories than did subjects without PTSD.

In sum, the results of the few studies with adults with PTSD show that PTSD patients generally suffer from poor memory to retrieve any type of information whether it be positive, negative or neutral. PTSD patients seem also to exhibit an implicit memory bias, but not an explicit memory bias for PTSD-related material and find it harder relative to controls, to retrive specific autobiographical memories.

7.5. Memory bias in children

A few studies have been carried out on memory bias in children with emotional disorders (Hammen & Zupan, 1984; Hughes et al., 1990; Whitman & Leitenberg, 1990; Neshat Doost et al., 1996; Taghavi et al., in preparartion). The results of these studies showed a memory bias in children with depressed mood. In other words, the evidence supported the negative self-schema model in children with depression and are consistent with the findings in adults. There is only one study on memory for threat related-material with anxious children which revealed no evidence of any memory bias. There is no study on children with PTSD.

Hammen and Zupan (1984) conducted research on the memory performance of children aged 8 to 12 years old. Subjects were divided into 2 groups on the basis of depression scale (Children's Depression Inventory; CDI; Kovacs, 1980) scores: depressed and non-depressed. Twenty two positive and 22 negative self-descriptive adjectives were used as stimuli. Each word was presented under one of two encoding tasks: structural (is this a long word?) Or self-referent (is this word like you?). The subjects were asked to answer the questions by yes or no responses. The final task included a list of four categories of words: positive-structural, positive-self-referent, negative-structural, and negative-self-referent. The words were displayed on 3 x 5 cm. index cards contained in a booklet and separated by blank index cards. The experimenter would say a word aloud and the subject would answer the questions. After encoding, subjects were unexpectedly asked to recall as many of the adjectives as they could in 5 minutes. Results showed that children recalled significantly more words under the self-reference instructions compared with the structural ones. They also recalled significantly more yes-rated self-reference words compared to no-rated self-reference words. Depressed children judged a significantly greater number of negative words as self-descriptive than did nondepressed children, while the nondepressed endorsed significantly more positive self-descriptive words than did the depressed. The nondepressed children recalled significantly more yes-rated self-reference positive-content words, and less negative-content words. They also recalled significantly more no-rated negative-content words than no-rated structural words.

Hughes, Worchel, Stanton, Stanton, and Hall (1990) studied the performance of 40 nonclinically depressed students and 49 nondepressed students on recall and recognition tasks. The mean age for both groups was 12.3 years. They read a story for the subjects and then administered the recall and recognition tests. The story consisted of 10 positive and 10 negative events. The subjects were asked to recall as many as events that they could remember in about 8 minutes. In the recognition test, 20 new events (10 positive and 10 negative) were mixed with the old events (10 positive and 10 negative) and were presented to the subjects. The results revealed that girls recalled significantly more events than boys. The subjects also recalled significantly more negative than positive events. On the recognition test, positive events were recognised more than negative ones. Depressed subjects discriminated fewer events than nondepressed subjects.

Whitman and Leitenberg (1990) carried out a study with a group of depressed children comparing them with normal control subjects on recall of positive and negative cues. Both groups were from fourth, fifth and sixth grade public elementary school students. The subjects were 52 (14 boys and 38 girls) children chosen from a large group of 247 students (106 boys and 141 girls) who completed the (CDI, Kovacs 1980/1981). Each subject was individually tested on a word association task shortly after taking the CDI. In the test session, subjects were read and shown one at a time 40 words placed on index cards. They were asked to generate what they felt was the most common or frequent association given to each word by other children. Following completion of the word association list, students were given the 40 words again and were asked to recall responses and rate how many of their responses were correct and how many were incorrect. The results indicated that children with depression did not remember the content of positive events as well as did non-depressed children. They also showed a poorer memory when asked to recall the correct answers that had been provided by the investigator.

Neshat Doost et al. (1996) carried out a study with depressed children. They recruited two groups of subjects with depression and mixed depression (mixed with anxiety) to study memory bias. The study involved two different tasks. One task consisted of self relevant (self descriptive) adjectives including positive, negative and neutral cues. The second task consisted of five categories of different non-self-relevant words: threat, happy, depressed-related, trauma-related and neutral-categorised words. The words were presented in recall and recognition tasks via a computer. The results revealed that in the first study, depressed subjects showed a memory bias towards negative (self reference) words, but they did not show any bias on the second task.

There is only one unpublished study with anxious subjects on memory bias (recall and recognition). Taghavi et al. (1995) selected 24 anxious patients to study memory bias using the same procedure as Neshat et al.'s second experiment. Anxious patients did not show any bias on the recall task while they revealed a bias on the recognition task. It has been argued that recognition tasks consist of two parts, familiarity and generation (Mandler, 1980). It seems that the first part is integrative while the second part is elaborative. Thus, the recognition bias in this study may be related to the integrative effect of the task.

In summary, the results of these few studies of young people show that children and adolescents with anxiety and depression more or less reveal the same pattern of memory performance as has been found in adults and the results are thus consistent with the adult theories (Beck, e.g., 1976; Bower, e.g.,1980; & Williams et al., 1988).

7.6. Purpose of research

The main aim of this research was to investigate memory bias using recall and recognition paradigms in three groups of young people (all children and adolescents aged 9 to 17): (1) children and adolescents with PTSD due to road traffic accidents or personal violence; (2) children of adult patients (parents) who suffer from PTSD, but whose children do not (their children were not involved in the accident or trauma); and, (3) normal control subjects.

The stimuli for this study were chosen from the initial study that established a corpus of emotionally laden words, including a subset related to traumatic experiences and several subsets related to threat, positive, sad, and neutral words (Chapter 4).

7.7. EXPERIMENT 1

RECALL AND RECOGNITION MEMORY PERFORMANCE IN CHILDREN AND ADOLESCENTS WITH POST-TRAUMATIC STRESS DISORDER

7.7.1. Hypothesis

Children who suffer from PTSD do not show a significant explicit memory bias toward negative words particularly trauma-related cues in line with the research on adults (e.g. Zeitlin & McNally, 1991).

7.7.2. Design

Recall (number of recalled words) and Recognition (***d'*** and ***Beta*** values) data were subjected to repeated measures analysis of variance (ANOVA) that included one fixed between-group factor (PTSD patients vs. normal control subjects) and one fixed within-group factor (5 categories of words: neutral, threat, depression-related, happy, and trauma-related).

7.7.3. Method

7.7.3.1. Subjects

Twenty four children and adolescents aged 9 to 17 who met Diagnostic and Statistical Manual of Mental Disorders (3rd Edition-Revised, DSM III-R; American Psychiatric Association, 1987) and International Classification Diseases (World Health Organization, ICD-10, 1992) criteria for PTSD and who were matched on age, sex, verbal IQ and reading ability with a group of children and adolescents without any psychiatric problems took part in this study. All PTSD subjects had been involved in Road Traffic or Personal Violence Accidents. Most of the child patients were recruited from the Children's Department of the Maudsley Hospital, where they had been seen by Prof. W. Yule, and a few subjects were identified from other clinics. Of the 24 PTSD subjects, 13 were boys and 11 girls with a mean age of 154.56 months (SD=34.33). The control group was recruited from several primary and secondary schools from different parts of London. Of the 25 normal subjects, 11 were boys and 14 girls with a mean age of 162.16 months (SD=22.52).

Those subjects who had low scores on a Basic Reading (below 85) and British Picture Vocabulary (below 80) tests were excluded (see subject characteristics). The results of memory performance on children of adults with PTSD will be reported later.

7.7.3.2. Materials

7.7.3.2.1. Psychological measures

1- Revised Impact of Event Scale (IES: Horowitz et al., 1979).

2- Revised Children's Manifest Anxiety Scale (RCMAS; Reynolds & Richmond, 1978).

3- Depression Self-Rating Scale (DSRS: Birleson, 1981).

4- British Picture Vocabulary scale (BPVS short form; Dunn et al., 1981).

5- Wechsler Objective Reading Dimensions (WORD; Basic Reading, Rust et al., 1993).

For more details on all psychological measures see Chapter 5.

7.7.3.2.2. Memory words

(1) Recall words: Five different categories of words including: (a) threatening words, (b) depressed words, (c) PTSD words related to trauma, (d) positive words, and (e) categorised neutral words were used. Recognition words: 120 words, including the 60 recall words and 60 new words, were randomly mixed.

All of the words were selected from the "The Dictionary of Emotional Words for Children and Adolescents " which was developed in a separate study (see Chapter 4). The groups of words were matched on length and frequency both within and across the recall and recognition sets. In both tasks, the words were presented in fixed random order. The font of the words was 24 with a visual angle of less than 2 degree. Words are shown in Appendix 7.1 and 7.2.

7.7.3.2.3. Instrumentation

The tests were conducted using a portable 486 IBM compatible computer with a colour screen measuring 24 cm by 18 cm. A two switch button-key connected to the computer allowed subjects' responses in the recognition test to be recorded by the computer. Two comfortable size chairs for the subject and the experimenter and also two tables of appropriate size and height, one for the computer and it's equipment, and another for writing, were used. The testing room was in a quiet environment away from other people. The experimenter ensured that heating and lighting of the room were adequate and that interruptions from outside the room were eliminated.

7.7.4. Procedure

7.7.4.1. Adminstration of the recall test

The test was carried out individually, and the subject was asked to sit in front of the computer in the testing room without any disruptions. The distance of subjects from the computer screen was about 60 cm. The subject was asked to read the following instructions aloud and asked if he/she had any questions about the test. The instructions were as follows:

"In this program we have some words which will be shown to you on the screen one after another. Look at each word, repeat it aloud three times, and think about it. Dose it make sense to you? Try to remember each word, because I will ask you to write them down at the end. This is not like any test that you may have done in your school!"

After ensuring that the test was clear to the subject and that he/she could read the instruction the presentation of the words began. Each word was presented in the centre of the screen for 7 seconds. When all of the 60 words had been presented, the subject was asked to count forward aloud in two's (2 4 6 ....) until the computer beeped.

This counting took 1.5 minutes. The purpose of this counting was to control for primacy and recency effects of the word list. The Pilot study indicated that without this distraction, subjects remembered more words from the beginning and the end of the word list than from the middle. Following the counting, the computer beeped and then the subject was asked to write down as many words as he/she could remember. The subject was informed that the spelling of the words was not important and was allowed to write down the words for 5 minutes until the computer beeped.

7.7.4.2. Adminstration of the recognition test

Following the recall test, the instructions for the recognition test were shown to the subject on the computer screen. The subjects were asked to look at each word on the screen and decide if the word had been shown to them earlier or not. A button box with two keys labelled "yes" and "no" was placed in front of the subject and allowed the subjects to respond to each word. All the answers and response latencies were recorded by the computer. The data for each subject were recorded in a file. Each data file contained the numbers of correct detections and false detections, correct rejections and false rejections, mean latency time for responding to each word in each category, and the standard deviations. The order of word presentation during recall and recognition was also recorded. The instructions for the recognition task were as follow:

> We now have some more words which will again be shown to you on the screen one after the other.
> Look at each word and think if it was one of the words that you were shown earlier.
> If you think it was.......................press Yes.
> If you think it was not..................press No.

Then 120 recognition words then were shown on the screen of the computer as for the recall task. The recall and recognition task together took around 20 minutes. At the end of the main task the subjects were asked to fill out the psychological measures.

7.7.5. Results

7.7.5.1. Subject characteristics

Means and standard deviations were calculated separately for each group on various measures of psychopathology for patients and controls (see Table 7.1). One way ANOVAs showed that there were no significant differences between the groups for age, verbal IQ, or reading ability (Appendix 7.3), but the clinical group scored significantly higher on the measures of depression ($F(1, 47) = 12.62$, $P = 0.0009$) and anxiety ($F(1, 47)$

= 10.59, P = 0.0021). PTSD patients' scores on the Impact of Event Scale are comparable with Yule et al.'s studies of child survivors of shipping disasters (Yule et al.,1992).

Table 7.1 Means and standard deviations (SD) of subject characteristics in the recall task.

	PTSD (N=24)		CONTROL (N=25)		
	MEAN	SD	MEAN	SD	
SEX (M:F)	13:11		11:14		
AGE (months)	156.32	34.07	162.16	22.52	n.s.
WORD	99.35	12.85	99.36	15.45	n.s.
BPVS	95.04	15.64	95.90	16.79	n.s.
DSRS	14.30	6.80	8.40	4.40	**
RCMAS	15.52	7.60	9.49	5.02	*
IES	34.78	18.34	-	-	

IES = Revised Impact of Event Scale, RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary Scale, WORD (Basic Reading) = Wechsler Objective Reading Dimensions * = P <.01; ** = P < 0.001

7.7.5.2. Results of the recall test

Words were considered correct only if they were written by the subjects in exactly the same grammatical form (e.g. if the target word was "worried" then "worry" was not acceptable) in which they had been presented, but spelling errors were allowed. For each subject the number of words correctly recalled was determined. Mean numbers of recalled words by the two groups of subjects and standard deviations are shown in Table 7.2 and Figure 7.1. The numbers of incorrect (false memory) and total (total memory) recalled words were counted. A one way ANOVA was carried out to compare the mean numbers of falsely recalled words for the two groups of subjects. The result showed no differences between PTSD patients and normal control subjects on the number of false recalled words [$F(1, 48) = 0.07$, $p = 0.745$], while PTSD patients recalled less words in total than controls subjects [1, 48) = 5.49, P = 0.023].

Figure 7.1. Mean of the recall words

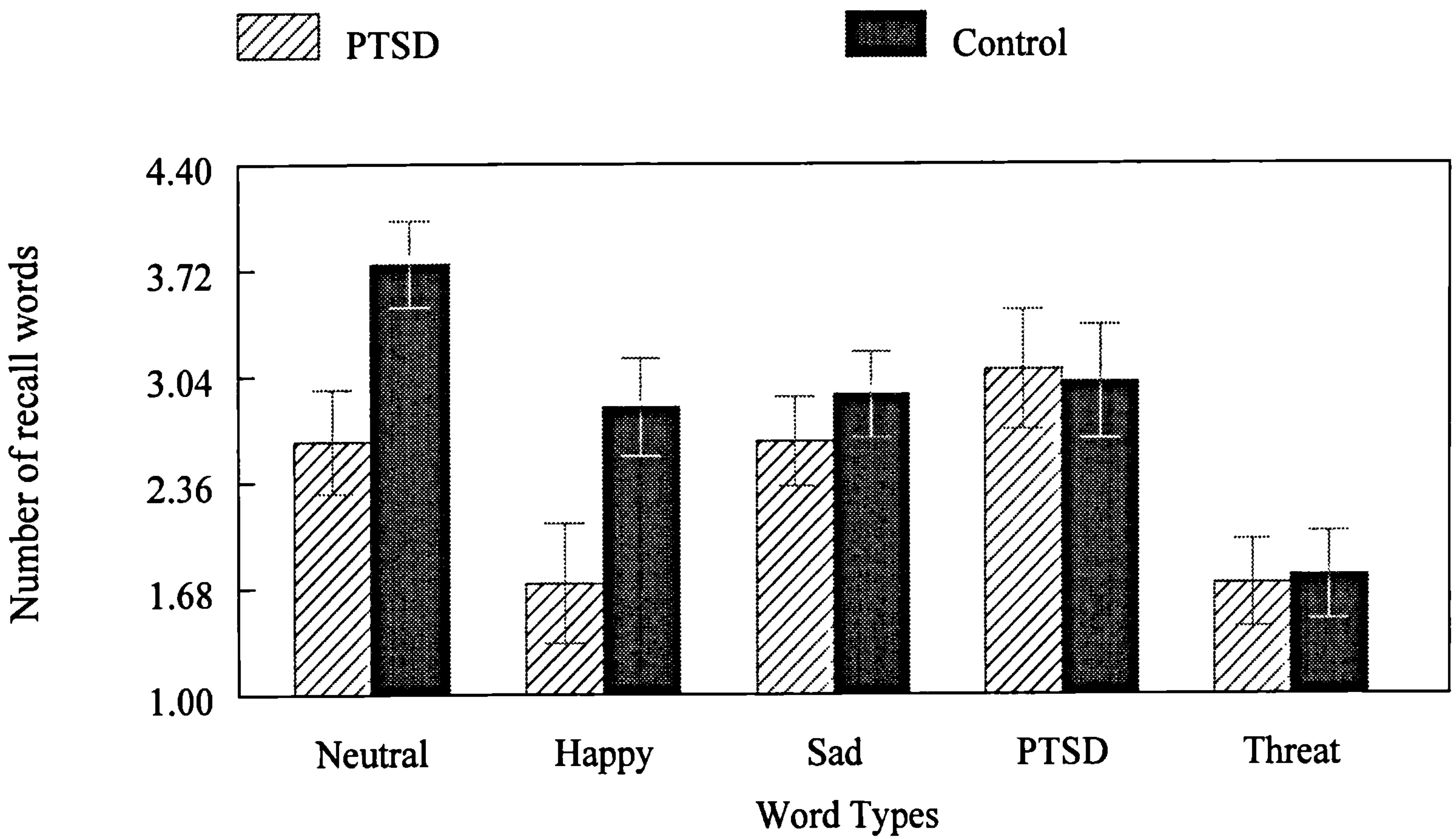


Table 7.2 Means and standard deviations of recalled words by PTSD and normal control subjects

GROUP WORD TYPE	CONTROL N = 25	PTSD N = 24
CATEGORISED NEUTRAL	3.76 (sd.=1.39)	2.62 (sd.=1.64)
DEPRESSION-RELATED	2.92 (sd.=1.38)	2.62 (sd.=1.40)
THREATENING	1.76 (sd.=1.39)	1.70 (sd.=1.37)
TRAUMA-RELATED	3.00 (sd.=1.82)	3.08 (sd.=1.87)
HAPPY	2.84 (sd.1.57)	1.71 (sd.=1.87)
FALSE RECALL	1.28 (sd.=2.09)	1.50 (sd.=2.60)
TOTAL RECALL	14.60 (sd.=3.65)	11.87 (sd.=4.46)

Mean numbers of words recalled for the five types of words were submitted to a two-way, Group (2) X Word Type (5) mixed-model ANOVA. The results showed a significant main effect of Group [$F(1, 47) = 4.90$, $P = 0.032$]. The PTSD group remembered less words than the normal control group. A significant effect was also found for Word Type [$F(4,188) = 7.47$, $P < 0.001$], while there was not any significant interaction between the two groups in recalling the words [$F (1, 47) = 1.81$, $P = 0.129$].

To study the Word Type effect a series of paired sample T-tests was carried out between pairs from the 5 categories of words. The results indicated that all subjects recalled more neutral words than threat words [$t (67) = 7.31$, $P < 0.001$], depressed words [$t (67) = 2.06$, $P = 0.043$], and happy words [$t (67) = 4.09$, $P < 0.001$]. They also recalled more trauma words than threat words [$t (67) = 5.82$, $P < 0.001$], and happy words [$t (67) = 3.5$, $P <0.001$], and finally all subjects remembered more depressed words than happy [$t (67) = 2.22$, $P < 0.03$], and threat words [$t (67) = 4.81$, $P < 0.001$].

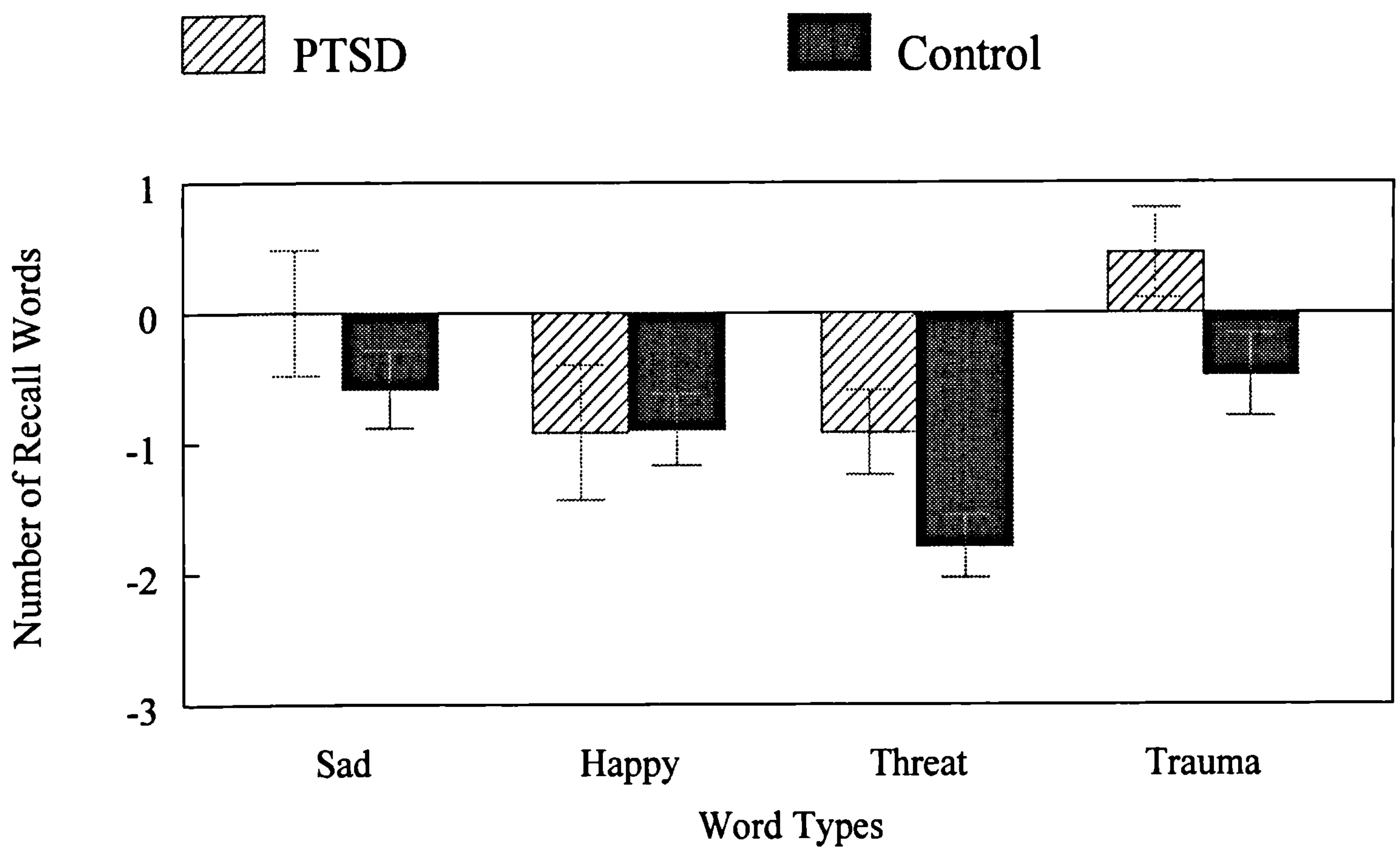
Therefore, the data revealed that PTSD patients did not show any bias towards trauma-related or other types of words relative to controls, but that they generally suffer from relatively poor explicit memory which is consistent with the findings with PTSD adults

(Zeitlin &McNally et al., 1990).

7.7.5.3. Differential index

This method was used by Zeitlin and McNally (1990). A differential index was computed by subtracting the mean number of recalled neutral (animal) words from the mean number of recalled words from each category of emotional words i.e. happy, depression-related, trauma-related and threat words. These computed variables were compared across the two groups in a full factorial Word Type (4) X Group (2) ANOVA. The results showed a trend for a main effect of Group [$F(1, 49) = 3.11$, $P = 0.084$], while the interaction did not reach significance [$F(3, 141) = 1.47$, $P = 0.226$]. There was also again the same strong significant effect of Word Type [$F(3, 141) = 6.57$, $P < 0.001$]. Figure 7.2 shows the differential indices of recalled emotional words in PTSD patients and normal control subjects.

Figure 7.2. Index of recall Words across PTSD & controls



7.7.5.4. Results of the recognition test

Signal detection theory (Hochhaus, 1972) was applied to analyse the data of the recognition memory test. According to signal detection theory, two measures or factors are involved in recognition memory tasks.

1- Discriminability measure (***d'***): This measure indicates the ability of the subject to discriminate between the old target items and the new distractors, which is independent of response bias factors. High values of ***d'*** show that the subject can discriminate old targets from new targets. This means that subjects have a better ratio of "Yes" responses to old items and "No" responses to the new items.

2- Response Bias (***Beta***): This factor is assumed to reflect the criterion adopted by the subject; in other words, the subject's degree of caution in deciding whether an item is new or old. High values of ***Beta*** indicate the subjects's willingness to say "Yes" to the items.

According to this model (e.g., Swets, 1964), estimations of ***d'*** and ***Beta*** can be calculated on the basis of two other parameters, hit rate (HR) and false alarm rate (FA). HR is the proportion of items presented which are confirmed by the subject and FA is the proportion of times that an item is reported when no such item was actually presented. The HR and FA are transformed to ***d'*** and ***Beta*** values by the following formula:

$$\boldsymbol{d'} = \text{ABS (HR) - ABS(FA)}$$
$$\boldsymbol{Beta} = \text{ORD(HR)/ORD(FA)}$$

ABS = The distance from the mean to the point of dichotomy in the standard normal distribution.

ORD = The ordinate at the point of dichotomy in the standard normal distribution (Hochhaus, 1972).

For each stimulus type the hit rates and false alarm rates were calculated, based on the number of correct detections from old words and the number of false detections from the new words as a proportion of the number of stimulus and filler words respectively. The means and standard diviations for the two groups are shown in Table 7.3.

Table 7.3 Proportions of hit rate (HR) and false alarms (FA) for PTSD and control subjects in the recognition memory test

			TYPE OF WORD				
			NEUTRAL	HAPPY	SAD	PTSD	THREAT
	HR	MEAN	0.795	0.719	0.753	0.774	0.791
PTSD		SD	0.190	0.215	0.200	0.180	0.115
	FA	MEAN	0.167	0.180	0.333	0.310	0.357
		SD	0.211	0.230	0.212	0.238	0.284
	HR	MEAN	0.843	0.740	0.793	0.797	0.693
CONTROL		SD	0.132	0.154	0.123	0.160	0.153
	FA	MEAN	0.107	0.137	0.197	0.278	0.235
		SD	0.111	0.104	0.131	0.251	0.124

HR = hit rate, FA = false alarm

d' and ***Beta*** values were calculated according to hit rates and false alarm rates for the five categories of words (neutral, happy, depression-related, threat and trauma-related). Table 7.4 and Figures 7.3 and 7.4 shows the ***d'*** and ***Beta*** valus.

Table 7.4 Means and standard deviations (SD) of ***d'*** and ***Beta*** values for PTSD patients and normal control subjects

			TYPE OF WORD				
			NEUTRAL	HAPPY	SAD	PTSD	THREAT
PTSD	***d'***	MEAN	2.21	1.85	1.33	1.61	1.36
		SD	1.62	1.41	1.17	1.29	1.28
	Beta	MEAN	2.98	3.76	0.92	1.84	3.27
		SD	3.98	5.02	0.54	2.81	4.87
CONTROL	***d'***	MEAN	2.67	2.04	1.98	1.63	1.37
		SD	0.96	0.93	0.80	1.03	0.49
	Beta	MEAN	3.45	3.22	2.21	1.16	1.31
		SD	4.14	4.56	3.53	1.12	0.70

7.7.5.5. *d'* analyses

A repeated measures, ANOVA was carried out for Group (2) X Word Type (5) for ***d'*** variables to test the sensitivity of the recognition performance. The results indicated no significant main effect of Group [$F(1, 47) = 0.93$, $P = 0.339$] while there were a trend towards an interaction of Word Type X Group [$F(1, 188) = 2.10$, $P = 0.083$], and a main effect of Word Type [$F(4, 188) = 18.19$, $P < 0.001$]. To examine the trend towards a significant interaction, a series of two way ANOVAs of Group (2) X Word Type (2) was performed to compare the two groups of subjects across each emotional word type relative to neutral words. The results indicated no significant main effects of Group nor any interactions between all categories of emotional words compared with neutral words. There was only a trend towards a main effect of Group for ***d'*** values of depression-related and neutral words [$F(1, 47) = 3.35$, $P = 0.074$].

Figure 7.3: Mean of d' values

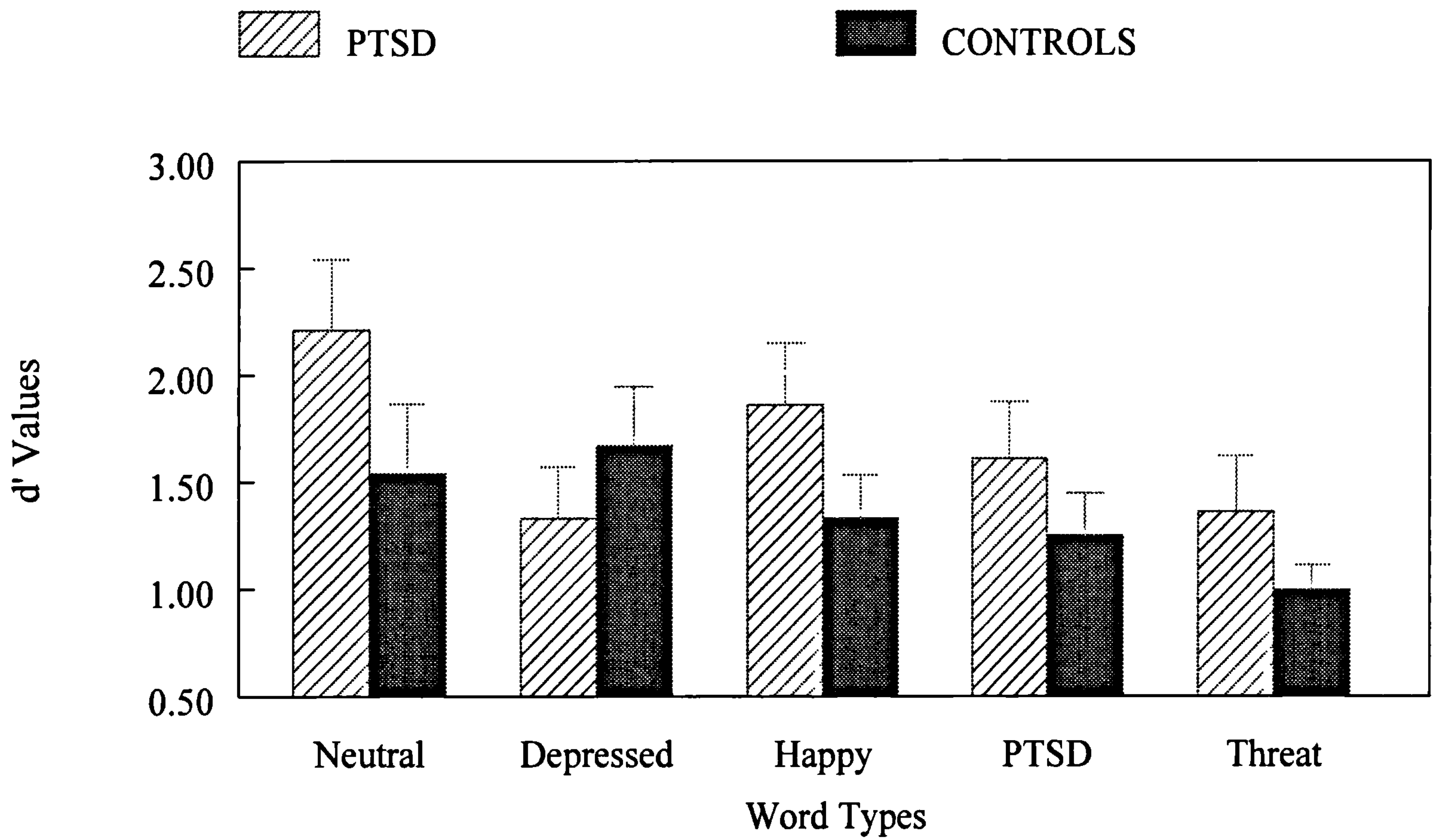
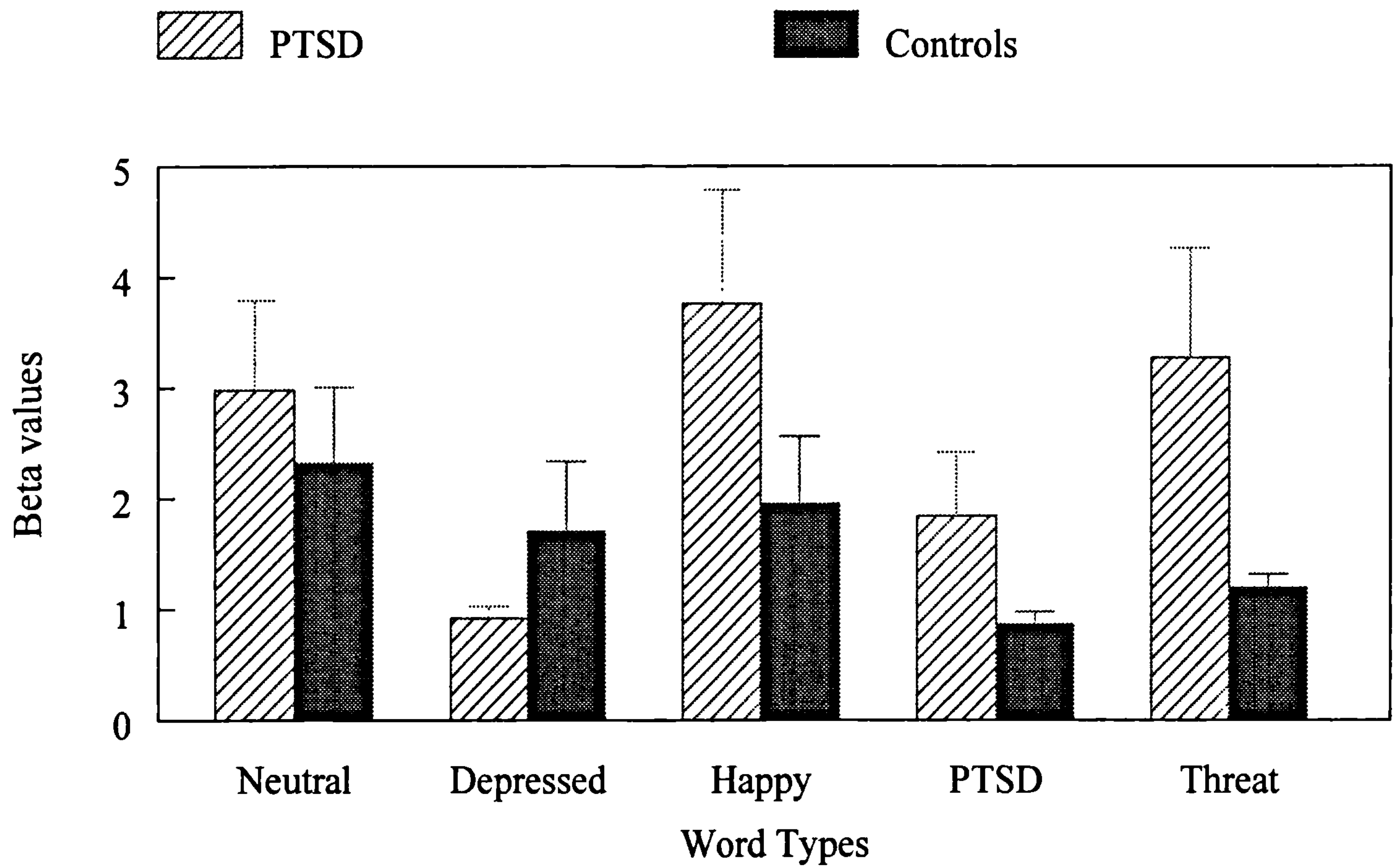


Figure 7.4: Mean of Beta values



To test the simple main effect of Word Type, a series of paired sample t-tests was carried out across all 5 categories of words. The results indicated that the subjects recognised more neutral words than threat words [t (48) = 7.75, P < 0.001], depressed-related words [t (48) = 5.46, P < 0.001], happy words [t (48) = 3.60, P < 0.001], and trauma words [t (48) = 6.03, P < 0.001]. The subjects also recognised more happy words than trauma-related words [t (48) = 2.68, P < 0.01], and threat words [t (48) = 4.04, P < 0.001].

7.7.5.6. *Beta* analyses

A repeated measures ANOVA was conducted with Group (2) X Word Type (5) to compare the ***Beta*** values across the two groups of subjects (PTSD patients and normal control subjects). The results revealed neither a main effect of Group nor any interaction (Appendix 7.3), but a significant of effect Word Type was found [F(4, 188) = 3.62, P = 0.007] between the two groups.

To examine the Word Type effect, a series of paired sample t-tests was carried out across all 5 categories of words for ***Beta*** values. The results indicated that the subjects had response bias more towards neutral words than depression-related words [t (48) = 2.59, P < 0.05], and trauma-related words [t (48) = 2.75, P < 0.01]. They also had response bias towards happy words more than depression-related words [t (48) = 2.44, P < 0.05] and trauma-related words [t (48) = 2.87, P < 0.01]. Figure 7.4 shows the ***Beta*** values of the PTSD patients and normal control subjects.

7.7.5.7. Type of trauma effects

Means and standard deviations were calculated separately for each sub-group of patients (RTA: road traffic accidents & PV: personal violence) on various measures of psychopathology. One way ANOVAs showed that there were no significant differences between the two sub-groups for verbal IQ, reading ability and the Impact of Event Scale (IES) (Appendix 7.4) but, the personal violence group scored significantly higher on the measures of depression [F(1, 22) = 11.74, P = 0.0024] and anxiety [F(1,22) = 4.69, P = 0.041] than the road traffic accident patients. The personal violence group was also significantly older than the road traffic accident group [F(1,22) = 25.01, P = 0.0001].

Table 7.5 indicates the means and standard deviations of the psychological scales for the two types of trauma.

Table 7.5 Means and standard deviations (SD) of psychological measures for two sub-group of PTSD patients (RTA: road traffic accident and PV: personal violence)

	RTA (N=15)		PV (N=9)		
	MEAN	SD	MEAN	SD	
SEX (M:F)	8:7	-	5:4	-	
AGE (months)	140.25	26.85	185.44	10.70	**
WORD	99.25	11.89	100.44	15.60	n.s.
BPVS	98.17	14.29	91.56	19.00	n.s.
DSRS	11.67	4.60	19.11	7.20	**
RCMAS	14.42	7.38	19.33	6.00	*
IES	33.83	13.8	39.67	23.90	n.s.
AVOIDANCE	17.83	8.65	21.56	12.30	n.s.
INTRUSION	16.08	6.61	18.11	12.00	n.s.

IES = Revised Impact of Event Scale, RCMAS = Revised Children Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary Scale, WORD (Basic Reading) = Wechsler Objective Reading Dimensions * = $P < 0.05$; ** = $P < 0.01$

Mean numbers and standard deviations of recalled words by the two sub-groups of patients are shown in the Table 7.6 and Figure 7.5.

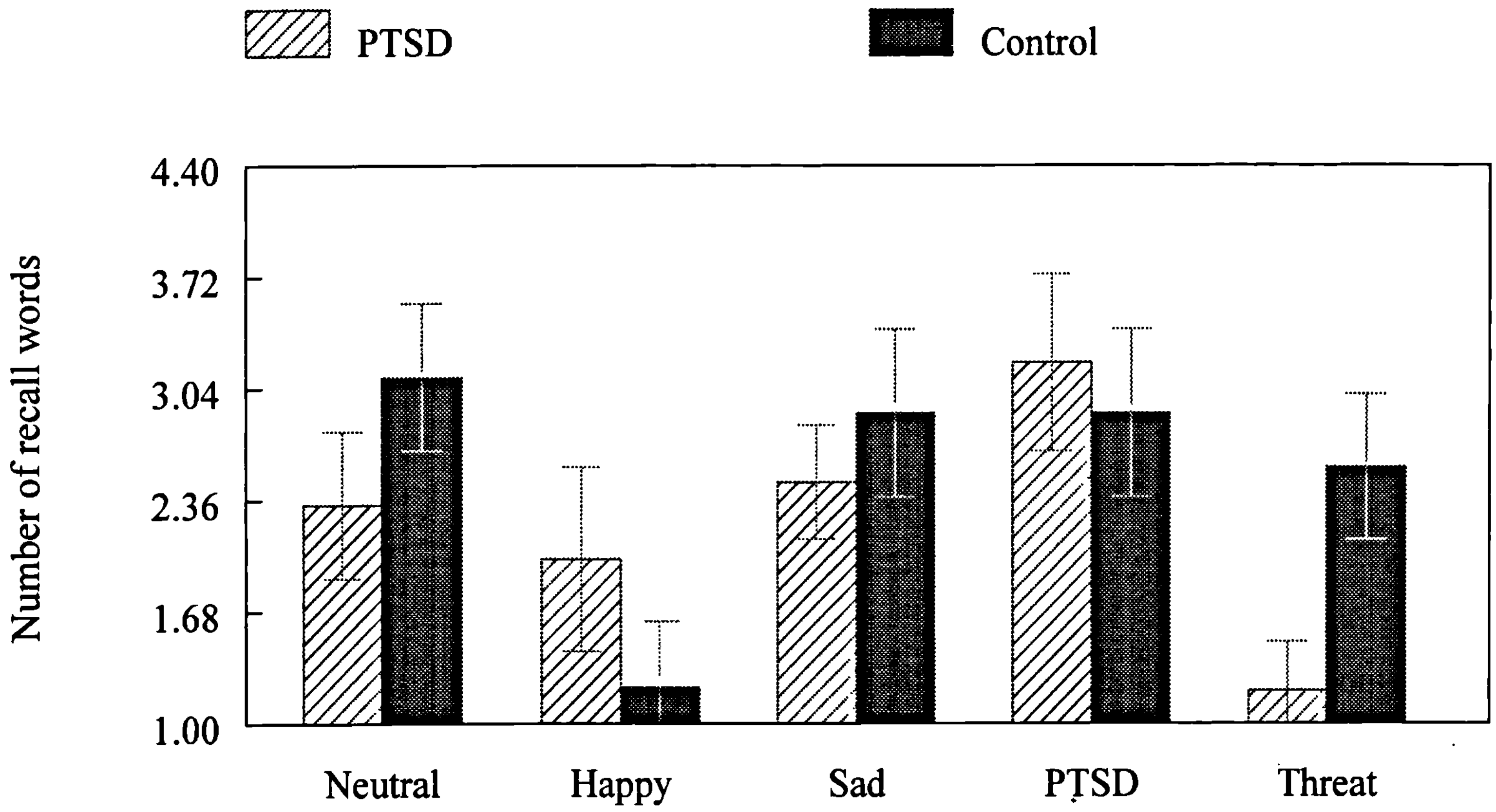
Table 7.6 Means and standard deviations (SD) of recalled words by two sub-groups of PTSD patients (RTA: road traffic accident & PV: personal violence)

WORD TYPE	RTA (N = 15)	PV (N = 9)
CATEGORISED NEUTRAL	2.33 (SD = 1.76)	3.11 (SD =1.36)
DEPRESSION-RELATED	2.47 (SD = 1.36)	2.89 (SD =1.54)
THREATENING	1.20 (SD = 1.15)	2.56 (SD =1.33)
TRAUMA-RELATED	3.20 (SD = 2.11)	2.89 (SD =1.54)
HAPPY	2.00 (SD = 2.17)	1.22 (SD =1.20)
FALSE RECALL	0.40 (SD =0.737)	3.33 (SD =3.54)
TOTAL RECALL	11.20 (SD = 5.25)	13.00 (SD =2.60)

To study the differences between the two types of traumatised patients (RTA and PV) on the recall test, a repeated measures Word Type (5) X Group (2) ANOVA was performed. There was no significant main effect of Group nor interaction or Word Type effect (Appendix 7.5)

A one Way ANOVA was undertaken to investigate the difference on false recalls between the two sub-groups of subjects. The results indicated that there was a significant difference between the two groups on the recall of false memories [$F(1, 22) = 9.90$, $P = 0.0047$], with the PV sub-group producing more false words than the RTA sub-group.

Figure 7.5. Mean of the recall words across RTA & PV



RTA = Road traffic accident, & PV = Personal violence

A repeated measures, ANOVA was carried out for Group (2) X Word Type (5) within subjects for ***d'*** variables to test the sensitivity of the recognition performance across PTSD patients who were involved in RTA and PV. The results indicated no significant main effect of Group nor any interaction (Appendix 7.6), but a Word Type effect [$F(4, 88) = 6.05$, $P < 0.001$]. To test the Word Type effect, a series of paired sample t-tests was carried out across all 5 categories of words. The results indicated that all PTSD patients recognised more neutral words than threat words [$t (43) = 4.29$, $P < 0.001$], depressed-related words [$t (23) = 3.70$, $P < 0.001$], and trauma-related words [$t (23) = 3.89$, $P < 0.001$]. The subjects also recognised more happy words than threat words [$t (23) = 2.13$, $P < 0.05$], depression-related words [$t (23) = 2.32$, $P < 0.05$], and trauma-related words [$F(23) = 2.13$, $P < 0.05$].

A repeated measures ANOVA was conducted of Group (2) X Word Type (5) to compare the ***Beta*** values across the two sub-groups of patients. The results revealed neither a main effect of Group nor any interaction or Word Type effect (Appendix 7.6).

7.7.5.8. Developmental analyses

Is the memory performance in young patients with PTSD affected by developmental aspects? To examine this point, all subjects were divided into two sub-groups, those below 13 years old and those over 13 years old. Subject characteristics for both sub-groups of patients and controls are shown in Tables 7.7 and 7.8.

Table 7.7 Means and standard deviations (SD) of psychological measures for PTSD and normal subjects (aged under 13 years old)

	PTSD (N = 12)		NORMAL (N = 7)		
	MEAN	SD	MEAN	SD	
AGE (months)	122.27	16.27	133.71	17.04	n.s.
WORD	97.72	11.86	101.14	14.85	n.s.
BPVS	98.00	13.58	94.43	17.90	n.s.
DSRS	11.00	3.55	7.43	2.37	*
RCMAS	12.82	6.73	9.28	1.98	n.s.

RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary Scale, WORD (Basic Reading) = Wechsler Objective Reading Dimensions * = $P < 0.05$

Table 7.8 Means and standard deviations (SD) of psychological measures for PTSD and normal subjects (aged over 13 years old)

	PTSD (N = 12)		NORMAL (N = 13)		
	MEAN	SD	MEAN	SD	
AGE (month)	184.17	10.88	178.15	10.87	n.s.
WORD	100.83	14.06	96.85	17.88	n.s.
BPVS	92.33	17.46	97.92	19.22	n.s.
DSRS	17.33	7.71	9.23	5.79	**
RCMAS	18.00	7.77	10.23	6.70	**

RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary Scale, WORD (Basic Reading) = Wechsler Objective Reading Dimensions. * = $P < .01$, ** $P = <.001$

One way ANOVAs showed that there were no significant differences between the two groups (aged under 13 years) on age, verbal IQ, reading ability, or anxiety scale scores (Appendix 7.7), but a significant differences between PTSD and control subgroups was found on depression scale scores [$F(1, 18) = 5.69$, $P = .029$].

Five control subjects (over 13 years old) were omitted to match the groups. One way ANOVA indicated that there were no significant differences between the two groups (aged over 13 years) on age, verbal IQ, and reading ability (Appendix 7.8), but there were significant differences on the anxiety scale [$F(1, 24) = 7.19$, $P = 0.013$], and the depression scale [$F(1, 24) = 8.91$, $P = 0.006$].

Regarding the under 13 year old subjects, the means of the recalled words for the five types were submitted to a two-way, Group (2) X WordType (5) mixed-model ANOVA. The results showed neither a main effect of Group, or any interaction effect (Appendix 7.9), but a main effect of Word Type was found [$F(4, 68) = 5.01$, $P = .001$].

To examine the Word Type effect, a series of paired sample t-tests was carried out across all 5 categories of words. The results indicated that the children under 13 years old remembered more neutral words than threat words [$t\ (18) = 3.96$, $P < 0.001$], and depression-related words more than threat words [$t\ (18) = 3.10$, $P < 0.006$]. They also remembered more happy words than threat words [$t\ (18) = 2.20$, $P < 0.05$]. Finally all children recalled more trauma-related words than threat words [$t\ (18) = 4.62$, $P < 0.001$].

A similar repeated measures Group (2) X Word Type (5) ANOVA was submitted to compare the groups over 13 years old. The results showed no main effect of Group [$F(1, 28) = 0.40$, $P = 0.534$], but a significant interaction [$F(4, 92) = 2.81$, $P = 0.03$], and a main effect of Word Type [$F(4, 92) = 5.05$, $P = .001$] were found. To deconstruct this interaction a series of Group (2) X Word Type (2) ANOVAs was performed to compare neutral words with each type of emotional word. The results revealed two trends towards an interaction when neutral words were compared with threat [$F(1, 23) = 3.69$, $P = 0.067$] and trauma [$F(1, 23) = 2.99$, $P = 0.097$] words. To examine these trends a series of ANOVAs was carried out across each sub-group separately to compare neutral words with threat and trauma-related words. The results indicated only a significant effect across controls for threat [$F(1, 17) = 16.46$, $P = 0.001$] trauma-related words [$F(1, 17) = 4.71$, $P = 0.045$] compared with neutral words. These findings revealed that normal controls remembered more neutral words than threat and trauma-related words in the over 13 year group.

Two repeated measures ANOVAs were conducted between Group (2) X Word Type (5) to compare ***d'*** and ***Beta*** values across the two sub-groups of subjects aged under 13 years old. The results revealed neither a main effect of Group for ***d'*** or ***Beta***, nor any interactions or Word Type effect for ***Beta*** values (Appendix 7.10), but a Word Type effect for ***d'*** [F(4, 68) = 11.59, P < 0.001] was found.To examine this Word Type effect, a series of paired sample t-tests was carried out across all 5 categories of words. The results indicated that the children under 13 years old recognised more neutral words than threat words [t (18) = 4.92, P < 0.001], depression-related words [t (18) = 4.43, P < 0.001], happy words [t (18) = 2.33, P = 0.05], and trauma-related words [t (18) = 5.33, P < 0.001]. They also recognised more threat words than depression-related words [t (18) = 2.21, P = 0.04], and happy words than trauma-related words [t (18) = 2.37, P = 0.029].

Another set of ANOVAs was carried out between Group (2) X Word Type (5) to compare ***d'*** and ***Beta*** values across PTSD patients and controls over 13 years old. The results showed no main effect of Group for ***d'***or ***Beta*** values nor interactions for ***d'***and ***Beta*** (Appendix 7.11). However, a Word Type effect for d' [F(4, 112) = 8.05, P = 0.001] was found. To test the Word Type effect a series of paired sample t-tests was counducted across all 5 categories of words. The results indicated that all the adolescents over 13 years old recognised more neutral words than threat words [t (29) = 5.97, P < 0.001], depression-related words [t (29) = 3.51, P < 0.001], happy words [t (29) = 2.74, P < 0.01], and trauma-related words [t (29) = 3.78, P < 0.001]. They also recognised more threat words than happy words [t (29) = 3.52, P < 0.001].

7.7.5.9. Sex effect

Another question that remains is whether the memory performance in young patients with PTSD is affected by their sex? To examine this point, PTSD subjects were divided into two sub-groups, boys, and girls. Subject characteristics for both sub-groups are shown in Table 7.9.

Table 7.9: Means and standard deviations (SD) of psychological measures for boys and girls with PTSD

	BOYS (N = 13)		GIRLS (N = 11)		
	MEAN	SD	MEAN	SD	
AGE (months)	155.42	33.25	153.63	37.09	n.s.
WORD	94.85	14.41	105.09	7.34	*
BPVS	95.69	17.01	95.82	14.79	n.s.
DSRS	12.62	4.89	15.91	8.23	n.s.
RCMS	12.69	7.42	18.55	6.47	n.s.
IES	28.08	16.92	42.09	17.69	n.s.
AVOIDANCE	14.67	8.53	24.10	10.10	*
INTRUSION	13.42	9.38	20.40	7.32	n.s.

IES = Revised Impact of Event Scale including Avoidance and Intrusion Subscales, RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary Scale, WORD (Basic Reading) = Wechsler Objective Reading Dimensions. * = $P < .05$

One way ANOVAs showed that there were no significant differences between boys and girls on age, verbal IQ, depression scores, anxiety scores, Impact of Event Scale, or intrusion subscale scores (Appendix 7.12), but the results indicated significant differences on reading ability [$F(1, 22) = 4.54$, $p = 0.044$], and the avoidance subscale of the Impact of Event Scale [$F(1, 22) = 5.64$, $P = .027$], with girls obtaining higher scores than boys. The girls with PTSD also obtained a near-significantly higher scores on the anxiety scale [[$F(1, 22) = 4.16$, $P = 0.054$], Impact of Event scores [$F(1,22) = 3.767$, $P = 0.066$], and intrusion sub-scale of the IES than boys with PTSD [$F(1, 22) = 3.67$, $P = 0.07$].

Regarding the recall task, means of the recalled words across the five word types were submitted to a two-way, Group (2) X Word Type (5) mixed-model ANOVA. The results showed neither a main effect of Group, or any interaction (Appendix 7.13), but a main effect of Word Type was found [$F(4, 88) = 3.87$, $P = 0.006$].

To examine the Word Type effect, a series of paired sample t-tests was carried out across all 5 categories of words. The results indicated that all PTSD patients remembered more neutral words than threat words [$t(23) = 2.83$, $P < 0.01$]. PTSD patients also recalled more depression-related words than threat words [$t(23) = 2.44$, $P < 0.05$]. They also remembered more trauma-related words than happy words [$t(23) = 3.24$, $P < 0.01$] and threat words [t {23) = 3.45, P = 0.01].

Two repeated measures ANOVAs were conducted for Group (2) X Word Type (5) compare ***d'*** and ***Beta*** values across boys and girls. The results revealed neither main effects of Group, nor any interactions for ***d'*** and ***Beta*** nor any Word Type effect of ***Beta*** values (Appendix 7.14). However, a Word Type effect for ***d'*** [$F(4, 88) = 7.07$, $P = 0.001$] was found. To examine the Word Type effect, a series of paired sample t-tests was carried out across all 5 categories of words. The results indicated that the PTSD patients recognised more neutral words than threat words [$t(23) = 4.29$, $P < 0.001$], depression-related words [$t(23) = 3.71$, $P < 0.01$], and trauma-related words [$t(23) = 3.89$, $P < 0.001$]. They also recognised more happy words than threat words [$t(23) = 2.13$, $P < 0.05$], depression-related words [$t(23) = 2.32$, $P < 0.05$], and trauma-related words [$t(23) = 2.13$, $P < 0.05$].

7.7.5.10. Correlational analyses

A summary of correlational analyses between psychological measures and different types of words is as follows:

1- Correlational analysis showed a significant correlation between the number of threat words recalled and the IES and the intrusion sub-scale of the IES.

2- There was higly significant correlation between the WORD Basic Reading Scale and recall of trauma-related words.

3- There were also a trend for a correlation between recalled threat-related words and the RCMAS anxiety scores and the DSRS depression scores.

4- A negative trend for a correlation between ***d'*** of threat words and RCMAS anxiety scores was found. There were also a trend of a correlation between ***d'*** of depression-related words with DSRS depression scores and RCMAS anxiety scores.

5- A strong correlation between number of trauma recalled words and reading ability when verbal IQ was controlled for was found. A negative trend for a correlation between number of happy recalled words and DSRS depression scores was also found.

6- DSRS depression scores were also positively correlated with ***Beta*** values of happy words. Tables 7.10, 7.11, 7.12, 7.13, and 7.14 show the correlational analyses.

Table 7.10 Correlations between psychological measures and number of the recalled words across all subjects (N = 49) (df = 46)

	WORD TYPE				
	Happy	Depressed	Threat	Trauma	Neutral
AGE	0.20	0.10	0.48	0.06	0.40
P	0.18	0.51	0.001**	0.69	0.005**
BPVS	0.21	0.18	0.01	-0.03	0.03
P	0.15	0.21	0.93	0.83	0.83
DSRS	-0.23	-0.13	0.27	0.13	0.04
P	0.10	0.35	0.06*	0.39	0.79
RCMAS	-0.10	-0.12	0.24	0.11	0.11
P	0.49	0.40	0.09*	0.47	0.43
WORD	0.24	0.12	0.12	0.38	0.14
P	0.10	0.43	0.42	0.007**	0.34

RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary Scale, WORD (Basic Reading) = Wechsler Objective Reading Dimensions. * = P < 0.05 & ** = P <0.01

Table 7.11 Correlations between scores IES including Avoidance and Intrusion Subscales & number of the recalled words across PTSD patients (N = 24) (df = 22)

	WORD TYPE				
	Happy	Depressed	Threat	Trauma	Neutral
IES	-0.02	-0.08	0.43	0.17	0.08
P	0.94	0.70	0.04	0.43	0.73
AVOIDANCE	-0.09	-0.04	0.35	0.17	0.10
P	0.70	0.86	0.10	0.46	0.65
INTRUSION	-0.09	-0.04	0.42	0.17	0.01
P	0.70	0.86	0.05*	0.46	0.96

Table 7.12 Partial correlations between psychological measures and number of the recalled words, controlling for those measures across all subjects (N = 49) (df = 46)

		WORD TYPE				
	Controlling	Happy	Depressed	Threat	Trauma	Neutral
DSRS	RCMAS	-0.25	-0.06	0.12	0.07	-0.07
P		0.09*	0.66	0.45	0.64	0.61
RCMAS	DSRS	0.12	-0.03	0.06	0.9	0.13
P		0.40	0.84	0.68	0.91	0.37
WORD	BPVS	0.14	0.01	0.14	0.50	0.15
P		0.34	0.95	0.35	0.001**	0.30
BPVS	WORD	0.09	0.14	-0.07	-0.35	-0.07
P		0.56	0.34	0.62	0.13	0.65

RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary Scale, WORD (Basic Reading) = Wechsler Objective Reading Dimensions. * = P < 0.05

Table 7.13 Correlations between psychological measures and ***d'*** value across all subjects (N = 49) (df = 47)

	WORD TYPE				
	Happy	Depressed	Threat	Trauma	Neutral
AGE	-0.09	-0.10	-0.20	-0.05	-0.21
P	0.53	0.50	0.16	0.73	0.16
BPVS	-0.06	0.02	0.14	-0.13	0.01
P	0.68	0.88	0.35	0.37	0.96
DSRS	-0.01	-0.24	-0.21	-0.02	-0.15
P	0.99	0.09	0.14	0.86	0.31
RCMAS	-0.10	-0.26	-0.28	0.09	-0.23
P	0.48	0.07*	0.05**	0.52	0.10
WORD	-0.13	-0.23	-0.14	-0.22	0.02
P	0.36	0.11	0.35	0.14	0.91

RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary Scale, WORD (Basic Reading) = Wechsler Objective Reading Dimensions. * = P < 0.05 & ** = P < 0.01

Table 7.14 Correlations between psychological measures and ***Beta*** value across all subjects (N = 49) (df = 47)

	WORD TYPE				
	Happy	Depressed	Threat	Trauma	Neutral
AGE	0.08	0.04	-0.17	0.05	0.11
P	0.57	0.80	0.23	0.76	0.39
BPVS	0.03	-0.08	-0.12	-0.11	-0.05
P	0.83	0.59	0.40	0.45	0.68
DSRS	0.28	-0.11	0.09	-0.08	-0.09
P	0.05*	0.43	0.53	0.59	0.45
RCMAS	0.19	-0.14	0.11	0.12	-0.02
P	0.15	0.35	0.45	0.39	0.88
WORD	0.23	0.12	0.05	-0.15	-0.03
P	0.10	0.39	0.79	0.29	0.73

RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary Scale, WORD (Basic Reading) = Wechsler Objective Reading Dimensions. * = $P < 0.05$

7.8. EXPERIMENT (2)

MEMORY BIAS (RECALL & RECOGNITION EFFECTS) IN CHILDREN OF ADULTS WITH PTSD

7.8.1. Hypothesis

Asymptomatic children of parents with PTSD will show a significant memory bias towards negative words, particularly trauma-related words, relative to neutral words and to normal-control subjects.

7.8.2. Method

The methodology of this experiment including design, materials, and procedures is the same as for Experiment 1.

7.8.3. Subjects

Eigheen children and adolescents (age 9 to 17) whose parents met Diagnostic and Statistical Manual of Mental Disorders (3rd Edition, DSM III-R; American Psychiatric Association, 1987) and International Classification of Diseases (World Health Organization, ICD-10; 1992) criteria for PTSD were matched on age, sex, verbal IQ and reading ability with a group of children and adolescents without any psychiatric problems participated in Experiment 2.

All the parents with PTSD were involved in Road Traffic incidents or Personal Violence. All the adult patients and their children were introduced by the clinicians of the Psychology Department of the Institute of Psychiatry. Of the 18 children of adults with PTSD, 9 were boys and 9 girls with a mean age of 154.89 months (SD 35.33). The control group was the same as used in Experiment 1.

Those who had low scores on basic reading (below 85) and British Picture Vocabulary (below 80) tests were excluded (see subject characteristics).

7.8.4. Results

7.8.5. Subject characteristics

Means and standard deviations were calculated separately for each group on various measures of psychopathology (see Table 7.15). One way ANOVAs showed that there were no significant differences between the groups on age, verbal IQ, reading ability, or anxiety as measured by the RCMAS (Appendix 7.15), but the children of adults with PTSD scored non-significantly higher on the depression scale [$F(1,41) = 3.56$, $P = 0.066$] than did the control group.

Table 7.15 Means and standard deviations (SD) of the psychological scales for children of adults with PTSD (CH.PTSD) and normal control subjects

	CH.PTSD (N = 18)		NORMAL (N = 25)		
	MEAN	SD	MEAN	SD	
SEX (M:F)	9:9	-	11:14	-	
AGE (months)	154.89	35.33	162.16	23.00	n.s.
WORD	99.50	6.29	99.36	15.00	n.s.
BPVS	100.44	14.45	95.90	17.00	n.s.
DSRS	11.39	5.98	8.40	4.40	*
RCMAS	11.56	7.01	9.49	5.00	n.s.

RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary Scale, WORD (Basic Reading) = Wechsler Objective Reading Dimensions. * = $P < 0.1$

7.8.6. Results of the free recall test

As in Experiment 1 the number of words correctly recalled by each subject was calculated. Means and standard deviations of the recalled words by the two groups of subjects are shown in Table 7.16 and Figure 7.6. Numbers of incorrectly (false memory) recalled words were counted. One way ANOVAs were carried out to compare the mean numbers of false recalled words and total memory for the two groups of subjects. The results showed no differences between the children of adults with PTSD and the normal control subjects (Appendix 7.16).

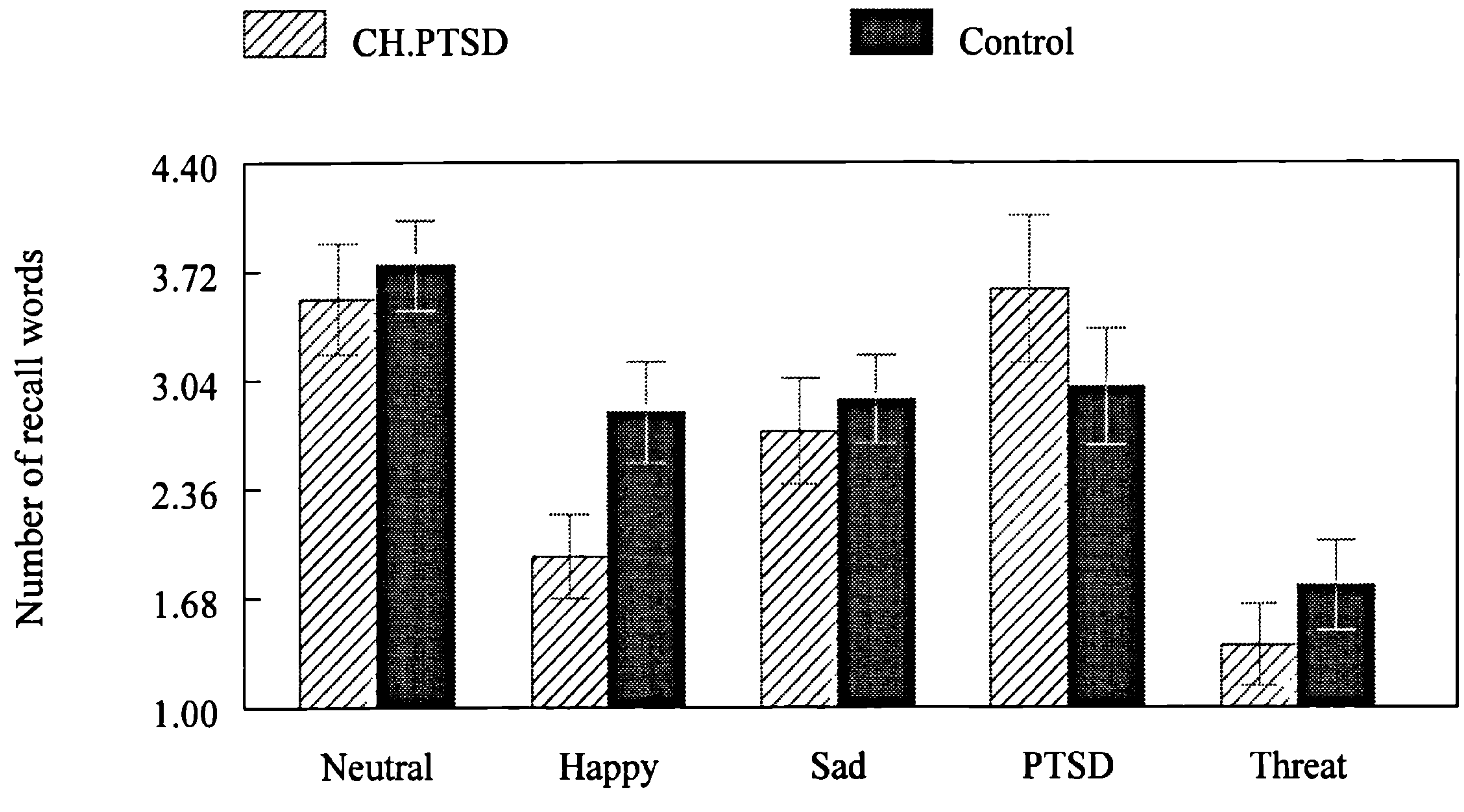
Table 7.16-Means and standard deviations (SD) of the recalled words by children of adults with PTSD (CH.PTSD) and normal control subjects

GROUP WORD TYPE	CONTROL N = 25	CH.PTSD N = 18
CATEGORISED NEUTRAL	3.76 (sd.=1.39)	3.56 (sd.=1.46)
DEPRESSION-RELATED	2.92 (sd.=1.38)	2.72 (sd.=1.41)
THREATENING	1.76 (sd.=1.39)	1.39 (sd.=1.09)
TRAUMA-RELATED	3.00 (sd.=1.82)	3.61 (sd.=1.94)
HAPPY (POSITIVE)	2.84 (sd.=1.57)	1.71 (sd.=1.87)
FALSE RECALL	1.28 (sd.=2.09)	0.67 (sd.=1.24)
TOTAL RECALL	14.60 (sd.=3.65)	13.78 (sd.=4.04)

Means of the numbers of recalled words were submitted to a two-way, Group (2) X Word Type (5) mixed model ANOVA. The results showed neither a main effect of Group, nor any interaction effects (Appendix 7.17). There was a significant Word Type effect [$F(4,164) = 13.02$, $P<0.001$] which showed that overall the subjects performed differently across different types of words.

Tests for simple effects of Word Type indicated that subjects recalled more neutral words than depressed words [$t (43) = 2.8$, $P < 0.008$], happy words [$t (43) = 3.91$, $P < 0.001$], and threat words [$t (43) = 7.21$, $P < 0.001$]. Both groups also remembered more trauma words than happy words [$t (43) = 2.1$, $P = .041$], and threat words [$t (43) = 4.67$, $P < 0.001$].

Figure 7.6. Mean of the recall words across CH.PTSD & controls



CH.PTSD = Children of adults with PTSD

7.8.7. Results of the recognition test

As with Experiment 1, signal detection theory (Hochhaus,1972) was applied to the data from the recognition memory test. For each stimulus type (neutral, happy, depression-related, trauma-related and threat) the hit rate and false alarm rate scores were counted from the number of correct detections and false detections as proportions of the numbers of stimulus and filler words respectively. The means and standard diviations of hit rates and false alarm rates for the two groups are shown in Table 7.17.

Table 7.17 Proportions of hit and false alarms for children of adults with PTSD (CH.PTSD) and control subjects in the recognition memory test

			TYPE OF WORD				
			NEUTRAL	HAPPY	SAD	PTSD	THREAT
CH.PTSD	HR	Mean	0.778	0.708	0.708	0.741	0.662
		SD	0.198	0.167	0.238	0.217	0.209
	FA	Mean	0.162	0.148	0.301	0.278	0.281
	.	SD	0.231	0.209	0.169	0.251	0.170
CONTROLS	HA	Mean	0.843	0.740	0.793	0.797	0.693
		SD	0.132	0.154	0.123	0.160	0.153
	FA	Mean	0.107	0.137	0.197	0.278	0.235
		SD	0.111	0.104	0.131	0.251	0.124

HR = Hit rate & FA = False alarm

The ***d'*** and ***Beta*** values were also calculated according to the hit rates and false alarm rates using the formulae applied in Experiment 1. These are shown in Table 7.18.

Table 7.18 Means and standard deviations (SD) of d' and Beta values for children of adults with PTSD (CH.PTSD) and normal control subjects

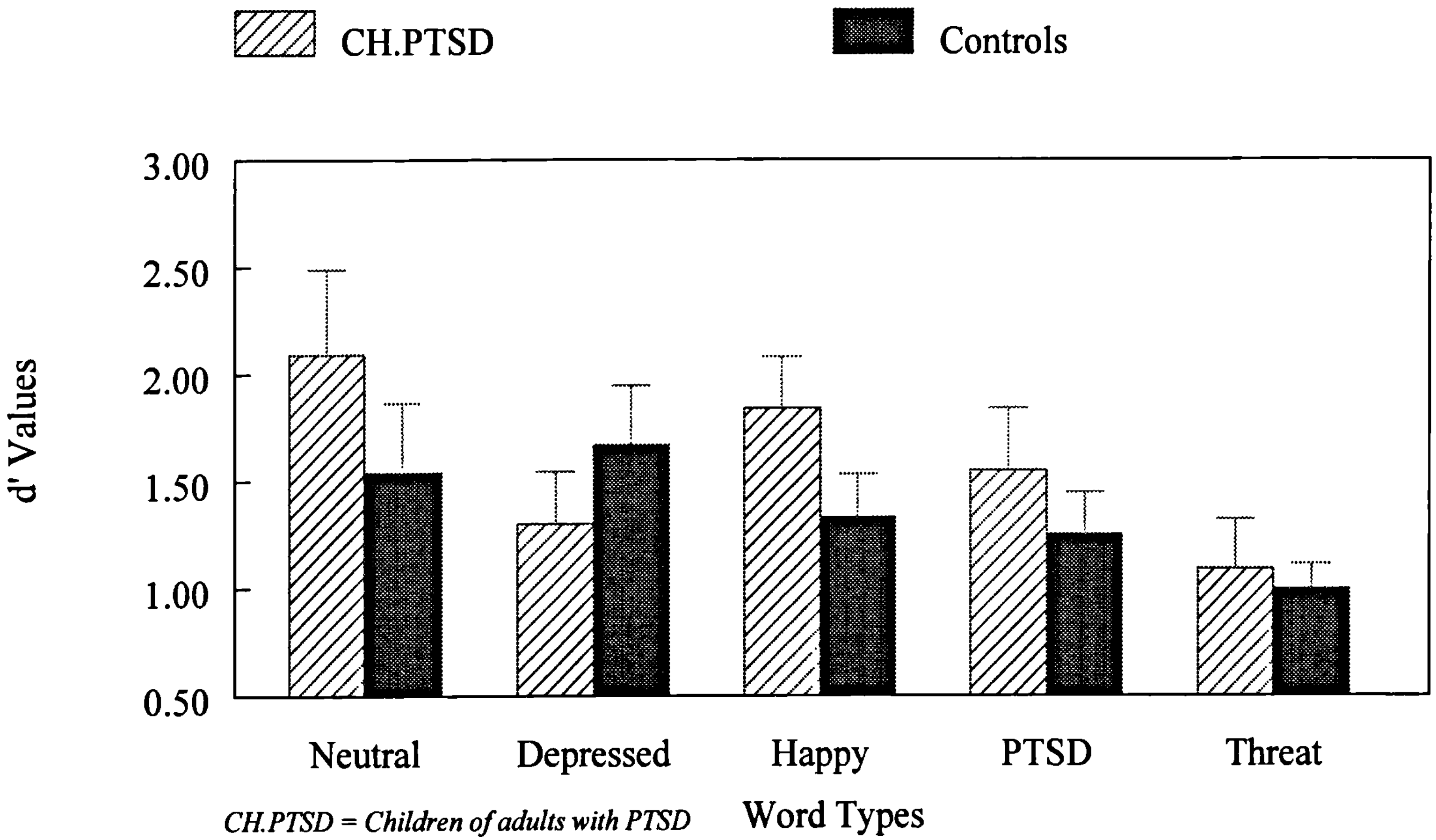
			TYPES OF WORDS				
			NEUTRAL	HAPPY	SAD	PTSD	THREAT
	d'	Mean	2.09	1.84	1.30	1.55	1.09
CH.PTSD		SD	1.69	1.02	1.04	1.24	0.98
	Beta	Mean	3.45	3.60	0.91	1.14	1.12
		SD	3.63	4.32	0.55	0.67	0.42
	d'	Mean	2.67	2.04	1.98	1.63	1.37
CONTROLS		SD	0.96	0.93	0.80	1.03	0.49
	Beta	Mean	3.45	3.22	2.21	1.16	1.31
		SD	4.14	4.56	3.53	1.12	0.70

7.8.9. *d'* analyses

A repeated measures (ANOVA) was carried out between Group (2) X Word Type (5) for ***d'*** to test the sensitivity of the recognition performance. The results indicated neither a significant main effect of Group nor any interaction (Appendix 7.18), but a main effect of Word Type was found [$F(1, 43) = 18.83$, $P < 0.001$].

To verify the main effect of Word Type a series of t-tests was performed across pairs from the five categories of words. The results indicated that subjects exhbited more senstivity in recognition for neutral words than threat words [$t(43) = 8$, $P < 0.001$], depressed words [$t(43) = 5.52$, $P < 0.001$], happy (positive) words [$t(43) = 2.90$, $P = 0.006$] and trauma words [$t(43) = 4.97$, $P < 0.001$]. The subjects were also more sensitive to happy (positive) words than threat words [$t(43) = 5.94$, $P < 0.001$], and trauma words [$t(43) = 2.37$, $P = 0.022$]. Figure 7.7 shows the ***d'*** values of the children of adults with PTSD and normal control subjects.

Figure 7.7: Mean of d' values



CH.PTSD = Children of adults with PTSD

7.8.10. *Beta* analyses

A repeated measures ANOVA was conducted between Group (2) X Word Type (5) to compare the ***Beta*** values across the two groups of subjects. The results revealed neither a main effect of Group nor any interaction (Appendix 7.19), but there was again a main effect by Word Type [$F(1, 43) = 7.07$, $P < 0.001$]. Figure 7.8 shows the ***Beta*** values of the two groups.

Simple t-tests to examine the effect of Word Type indicated that subjects had higher ***Beta*** values for to neutral words than threat words [$t(43) = 3.77$, $P = .001$], depressed words [$t(43) = 2.67$, $P = .011$], trauma words [$t(43)$ 4.02, $P = .000$], and happy words [$t(43) = 3.36$, $P = .002$]. They also had higher ***Beta*** values for happy words than depressed words [$t(43) = 2.15$, $P = .037$], and trauma-related words [$t(43) = 3.46$, $p = .001$].

In sum the results of these two analyses for ***d'*** and ***Beta*** indicated that children of adults with PTSD do not show any selective memory bias on the recognition task. These findings confirmed the results of the recall task.

7.8.11. Correlational analyses

Correlational analysis with the data from children of PTSD indicated the following results:

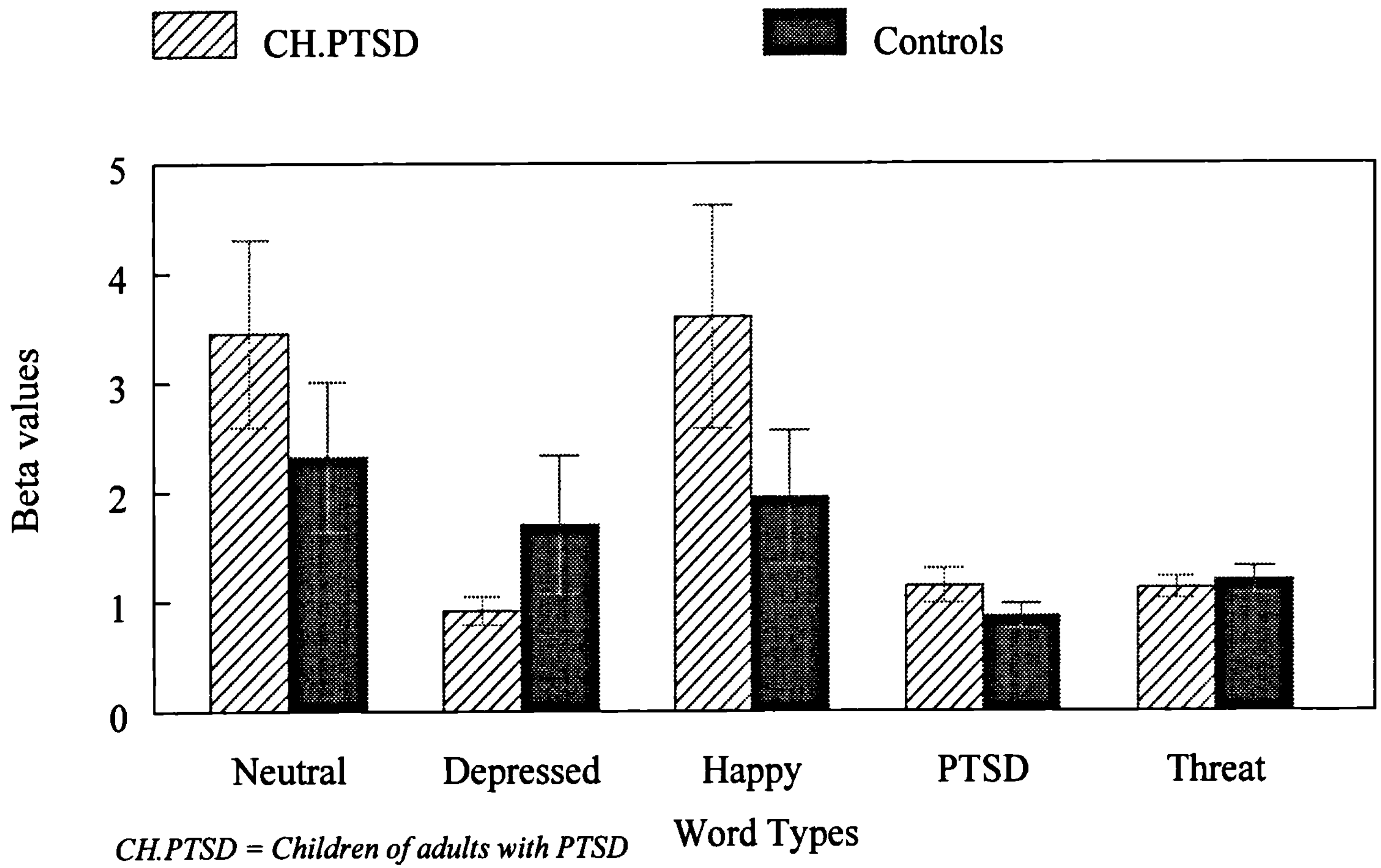
1- Significant correlation between neutral recalled words and age and RCMAS anxiety scores was found. There was also a trend towards a correlation between the number of neutral recalled words and depression scale.

2- A negative trend towards a correlation was indicated between ***d'*** value of trauma words and Basic Reading Scale.

3- The results showed a nearly significant negative correlations between British Picture Vocabulary scores and ***d'*** values of threat words, depressed-related words, and trauma-related words.

4- Regarding ***Beta*** values, negative correlations between Beta values of trauma-related words and BPVS and Basic Reading Scale scores words were found.

Figure 7.8 Mean of Beta values across CH.PTSD & controls



CH.PTSD = Children of adults with PTSD

5- Finally, the results revealed a trend towards a correlation between ***Beta*** values of threat words and Basic Reading Scale scores. Tables 7.19 and 7.20 show the correlational analyses.

6- There were negative correlations between ***Beta*** values of trauma-related words and verbal IQ and reading ability.

Table 7.19 Correlations between psychological measures and numbers of recalled words across all children of adults with PTSD and normal controls (N = 43) (df = 41)

	WORD TYPE				
	Happy	Depressed	Threat	Trauma	Neutral
AGE	0.18	0.26	-0.03	0.03	0.37
P	0.25	0.09	0.83	0.85	0.015**
BPVS	0.18	-0.09	0.09	-0.07	0.24
P	0.25	0.57	0.54	0.64	0.12
DSRS	-0.04	0.04	0.07	0.14	0.27
P	0.81	0.81	0.96	0.37	0.08*
RCMAS	0.08	0.02	0.14	0.23	0.41
P	0.62	0.88	0.38	0.14	0.006**
WORD	0.13	0.06	0.08	0.23	0.13
P	0.38	0.71	0.59	0.13	0.40

RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary Scale, WORD (Basic Reading) = Wechsler Objective Reading Dimensions. * = P < 0.05 & ** = P <0.01

Table 7.20 Correlations between psychological measures and ***d'*** value across all subjects (N = 43) (df = 41)

	WORD TYPE				
	Happy	Depressed	Threat	Trauma	Neutral
AGE	-0.21	-0.11	-0.04	-0.10	-0.20
P	0.17	0.49	0.80	0.54	0.19
BPVS	-0.25	-0.29	-0.29	-0.29	0.10
P	0.1*	0.06*	0.06*	0.06*	0.54
DSRS	-0.02	-0.09	-0.06	-0.14	-0.01
P	0.89	0.57	0.68	0.36	0.96
RCMAS	-0.02	-0.08	-0.06	-0.14	-0.19
P	0.88	0.62	0.70	0.39	0.90
WORD	-0.19	-0.1	-0.10	-0.28	0.11
P	0.25	0.54	0.50	0.07*	0.50

RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary Scale, WORD (Basic Reading) = Wechsler Objective Reading Dimensions. * = P < 0.05 & ** = P <0.01

Table 7.21 Correlations between psychological measures and ***Beta*** value across all subjects (N = 43) (df = 41)

	WORD TYPE				
	Happy	Depressed	Threat	Trauma	Neutral
AGE	-0.09	0.02	0.03	-0.01	0.12
P	0.58	0.88	0.84	0.97	0.44
BPVS	0.22	0.07	-0.14	-0.30	-0.24
P	0.45	0.64	0.38	0.05*	0.12
DSRS	0.17	0.06	0.06	-0.07	-0.02
P	0.28	0.07	0.69	0.63	0.88
RCMAS	-0.08	-0.07	-0.07	-0.26	0.08
P	0.61	0.68	0.64	0.09	0.62
WORD	0.18	0.12	0.04	-0.31	-0.30
P	0.23	0.43	0.79	0.05*	0.05*

RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary Scale, WORD (Basic Reading) = Wechsler Objective Reading Dimensions. * = P < 0.05 & ** = P <0.01

7.9. COMPARISON ACROSS THREE GROUPS: CHILDREN WITH PTSD, CHILDREN OF ADULTS WITH PTSD, & NORMAL CONTROLS

Analyses were carried out to compare the performance of the three groups on the recall and recognition tasks. A repeated measures ANOVA between Group (3) X Word Type (5) was conducted. The results showed neither a main effect of Group nor an intreaction (Appendix 7.20), but a main effect of Word Type [$F(2, 64) = 15.47$, $P < 0.001$] was found.

To examine this effect, a series of t-tests was carried out. The results indicated that all subjects recalled more neutral words than depression-related words [$t(67) = 2.06$, $P = 0.043$], happy words [$t(67) = 4.09$, $P = .000$], and threat words [$t(67) = 7.31$, $P < 0.001$].

The subjects also recalled more trauma-related words than happy words [t (67) = 3.50, P = .001], and threat words [t (67) = 5.82, P < 0.001], while they remembered more happy words than threat words [t (67) = 2.22, P = .03], and depression-related words [t (67) = 2.22, p = .03].

Two sets of repeated measures ANOVA between Group (3) X Word Types were carried out to compare the three groups on ***d'*** and ***Beta*** values. The results showed neither main effects of Group for ***d'*** and ***Beta*** nor any interactions (Appendix 7.21). But the results revealed significant main effects of Word Type for ***d'*** [F(4, 256) = 24.93, P <0.001] and for ***Beta*** [F(4, 256) = 7.26, P < 0.001].

To examine the Word Type effects, two series of t-tests were carried ou. Regarding ***d'***, the results indicated that all subjects recognized more neutral words than threat words [t (66) = 8.92, P < 0.001], depression-related words [t (66) = 6.55, P < 0.001], happy words [t (66) = 3.54, P = .001], and trauma-related words [t (66) = 6.21, P < 0.001]. The subjects also recalled more depression-related words than threat words [t (66) = 2.64, P = 0.01]. They also recognized more happy words than threat words [t (66) = 5.58, P < 0.001], depression-related words [t (66) = 2.99, P = .004], and trauma-related words [t (66) = 3.04, P = 0.003]. Finally all subjects recognized more trauma-related words than threat words [t (66) = 3.02, P 0.004] and happy words [t (66) 3.04, P = 0.003].

The results of second series of t-test show that all the subjects had more response bias towards neutral words than threat words [t (66) 2.12, P = 0.038], depression-related words [t (66) = 3.69, P < 0.001], and trauma-related words [t (66) = 3.72, P < 0.001]. All the subjects also had response bias more towards happy words than threat words [t (66) = 2.62, P = 0.011], depression-related words [t (66) 3.38, P = 0.001], and trauma-related words [t (66) = 3.72, P < 0.001].

Correlational analyses indicated significant relationship between the recall of neutral words and age [r (df = 67) = 0.39, P = 0.001], between RCMAS scores and recall of threat words [r (df = 67) = 0.24, P = 0.048], and between WORD scores and the recall of trauma-related words [r (df = 67) = 0.32, P = 0.008].

7.10. Discussion

The main aim of this chapter was to study explicit memory bias in young people with PTSD and children of adults with PTSD. Explicit memory is defined as a conscious recollection of previous experiences by a direct test such as recall or recognition. In the current study recall and recognition paradigms were used to assess explicit memory bias for negative emotional material in three groups of children and adolescents: (1) children and adolescents with PTSD due to road traffic accidents or personal violence; (2) children of adult patients (parents) who suffer from PTSD, but whose children do not (their children were not involved in the accident or trauma); and, (3) normal control subjects.

The results of Experiment 1 of the current study indicated that children and adolescents with PTSD generally recalled less words than control subjects but this was not affected by word type. All subjects recalled more neutral words than threat and happy words. They also remembered more trauma-related and depression-related words than happy and threat words. The results of the recognition test revealed that only control subjects recognised more depressed words than PTSD patients but not significantly. Both groups were sensitive towards all types of words in the same way. The results also indicated that the two sub-groups of PTSD patients which were involved in the road traffic or personal violence accidents performed in the same way on the recall task, but that the PV sub-group produced more falsely recalled words than the RTA sub-group. Also both RTA and PV sub-groups performed in the same way on the recognition test, although both of them recognised more neutral words than other types of words. There was not any difference between PTSD children and normal subjects (under 13 years) on the recall and recognition task, while control adolescents remembered more neutral words than adolescents with PTSD. Regarding sex effects, the results did not show any differences between boys and girls with PTSD on the recall or recognition tasks. Finally, correlational analysis revealed a significant relationship between reading ability and the recall of trauma-related words which has confirmed by partial correlational analysis when verbal IQ was controlled. Significant correlations between IES, Intrusion sub-scale of IES and the number of recalled threat words were found. Non-significant correlations between the DSRS depression scale, the RCMAS anxiety scale and the number of threat recalled words were also found.

The results of the second experiment revealed no significant differences on the recall or recognition tasks between children of adults with PTSD and normal controls. All subjects, as in Experiment 1, remembered more neutral words than other types of words and recalled neutral words correlated with the age and self report anxiety. Comparing across all three groups, the results showed no differences on the recall task. Again all subjects recalled more neutral words than other categories of words. They also revealed more response bias towards neutral words than other types of word.

The findings of the current studies support the hypotheses. Both experimental groups (namely, children with PTSD and children of adults with PTSD) did not show a significant explicit memory bias toward negative words particularly trauma-related cues relative to controls. The findings also support those of Zeitlin & McNally (1991) who found no significant explicit memory bias in adults who suffer from PTSD.

The findings of the current research (recall test) are also partly consistent with the findings of Taghavi et al. (1996) with anxious child patients who found no explicit recall memory bias in anxious subjects, but who found some differences in the recognition task, in which anxious subjects recognised more threat words than controls. This difference could be related to the nature of the two PTSD and anxiety disorders which seem different in some aspects, particularly cognitive functioning. Furthermore, the number of words recalled by child PTSD patients was significantly less than by control subjects in the present study, while there was no finding for the anxiety subjects (Taghavi et al.,1996). This difference leads one to propose that PTSD patients are different in some cognitive aspects from generally anxious patients. From a clinical perspective, one of the major problems in PTSD patients is poor memory performance while anxious patients do not report such problems. PTSD develops by an external cue while anxiety is probably more affected by an internal cue, and some symptoms such as flashback and memory disturbance which are common in PTSD patients do not appear in anxiety disorder. Thus it is easy to see different cognitive pattern in PTSD and anxiety.

The traditional view about explicit and implicit memory tries to distinguish between these two types of memory. According to this view implicit memory is facilitated by integrative processing, whereas elaborative processing plays an important role in facilitating retrieval from explicit memory (Graf & Schater, 1985; Schacter & Graf, 1986; Schacter, 1987). Within this framework, the current findings about explicit memory (recall and recognition) supported the integrative processing of traumatic information about PTSD, but not the elaborative processing model.

The results of the recognition task show that there was no significant difference between the two groups. This means that PTSD patients discriminate the old words from new words much the same as normal control subjects. Hence, they do not show a relative memory bias in the recognition task. This finding is in part in contrast with Zeitlin and McNally's (1991) which found an implicit memory bias in adults with PTSD. This shows that the nature of the recognition task as an expicit memory assessment is different from the word-stem compelition task which used by Zeitlin and McNally.

Research with anxious patients shows that selective attention to emotional cues is a strong effect (in tasks such as the Stroop task), whereas in depressed patients it is not. In contrast, it is easy to show that depressed subjects recall more negative words related to themselves in memory tasks (e.g. Mathews, 1993; Watkins et al., 1992), while it is difficult to show the same pattern in anxious patients. Therefore, PTSD patients and children of adults with PTSD do not show any memory bias, which is in agreement with these findings.

The results of the only study on explicit, non-autobiographical memory with adults with PTSD showed that combat veterans with PTSD exhibited an implicit memory bias favoring trauma-relevant information, but they showed a non-significant explicit memory bias for trauma-related words (Zeitlin and McNally, 1991). Adults subjects with PTSD also exhibited autobiographical memory disturbaces. Vietnam combat veterans with PTSD showed difficulties retrieving specific personal memories in response to cue words having either positive, neutral, or negative valence (McNally et al., 1994). Recently, Neshat Doost et al. (1996) found that depressed children exhibited a memory bias only for negative words (depression-related words) in a recall and recognition task when the task consisted of self relevant (self descriptive) adjective including positive, negative and neutral stimuli, while they did not exhibit any bias toward negative words which were not self descriptive. Taghavi et al. (1995) found that children with generalised anxiety disorder did not show any bias for threat words on a recall task while they revealed a bias for threat words on the recognition task.

The results of the total recalled words of the present study (Experiment 1) have shown that children with PTSD recalled fewer words than normal control subjects. This finding is consistent with clinical features of PTSD and other findings regarding poor memory in child patients who suffer from PTSD (Yule, & Gold 1993; Last; 1993; Bouman & Scholing; 1992). PTSD patients also recalled fewer happy words than other types of words compared with a control group. PTSD patients and normal control subjects recalled the same number of trauma-related words whereas PTSD patients recalled fewer neutral words than control subjects; thus PTSD patients have a relative memory bias toward trauma-related words. These results are in agreement with Zeitlin et al.'s (1991) who found that adult PTSD patients recalled fewer neutral and positive words than negative emotional words, while their control group recalled more neutral and positive words than other types of words.

Regarding the second experiment, while children of adults with PTSD show selective attention towards trauma-related and general threat words in the Stroop task (see Chapter 5, Experiment 2), they do not show any memory bias towards emotional words in both recall and recognition. Interestingly, PTSD patients and the children of adults with PTSD performed similarly on both tasks. This similar pattern of cognitive functions suggests that children of adults with PTSD were affected by the parents' problems (trauma).

In summary the results of the recall and recognition tasks with two groups of subjects i.e. PTSD patients and children of adults with PTSD revealed that they do not show a memory bias towards trauma-related words or other types of emotional words relative to a normal control group. It seems that the PTSD findings are more or less in agreement with the prediction of the Williams et al. (1988) model. They hypothesised that patients with anxiety disorders should show an attentional bias towards threat-related cues while they should not show a memory bias for such material.

CHAPTER 8

MEMORY DEFICITS IN CHILD PATIENTS WITH PTSD (PERFORMANCE ON THE RIVERMEAD BEHAVIOURAL MEMORY TEST)

8.1. Introduction

Patients with posttraumatic stress disorder (PTSD) often complain about a wide range of cognitive disturbances such as memory, concentration, attention, and difficulties in planning and judgment. Evaluation of cognitive aspects can help to define the nature of the symptoms in PTSD. Various cognitive symptoms including memory problems, psychogenic amnesia and concentration disturbance are described in the American Psychiatric Association's (1994) diagnostic criteria for the disorder (see Chapter 2). Empirical evidence of cognitive changes in PTSD would help to discriminate this disorder from other closely related syndromes such as anxiety and major depression. Application of neuropsychological assessment techniques to study the cognitive factors in PTSD could be useful in the clinical and research exploration of the aetiology of PTSD. Neuropsychological studies can investigate diagnostic criteria by discovering which cognitive features are associated with trauma. Linking brain functions and emotional disturbance may lead to better treatment planning for the disorder. Cognitive evaluations can also contribute to theoritical explanations of PTSD.

This chapter reviews the literature related to the cognitive assessment of PTSD using standard neuropsychological tests, and then discusses an experiment which evaluated the memory performance of patients with PTSD using a standard neuropsychological memory test, the Rivermead Behavioural Memory Test (RBMT, Wilson et al., 1989).

8.2. Neuropsychological research on adults with PTSD

Patients with PTSD show a wide range of memory impairments, ranging from involuntary recollections of the trauma to psychogenic amnesia (Yehuda et al., 1995).

Attentional and concentration dysfunction may also accompany these memory impairments. Several studies present evidence of neuropsychological impairment among PTSD patients particularly those who were prisoners of war (POWs). Investigators suggested that central nervous system (CNS) damage may have a basic role in the performance difficulties of these people (Sutker et al. 1990).

Despite, the obvious memory-related dysfunction in PTSD, there has been only a little published research on the performance of subjects with PTSD on standard neuropsychological memory tests. Most of these studies have shown some neuropsychological and neuropsychiatric problems in patients with PTSD. The nature of these impairments varied from global cognitive and memory deficits to specific memory disturbances for trauma related cues. Most of the studies were carried out with war survivors such as those from World War II and the Korean conflict. There is very little research about neuropsychological aspects following other types of trauma.

One of the first studies in this area was carried out by Klonoff et al. (1976). Their study consisted of three different parts: neuropsychological; psychiatric; and physical. The samples were prisoners of war who were interned in Japan (high stress group) or Europe (low stress group) during the Second World War. The neuropsychological examination consisted of the following: Wechsler Adult Intelligence Scale, Category Test, Tactual Performance Test, Finger Tapping, Speech Perception, Seashore Rhythm, and Trail Making Test. The results indicated that the high stress group's performance was significantly worse on two variables: the Halstead Category and the Seashore Rhythm Tests. Some what similar results were found on the Trail-Making Test, with the high stress group's performance on trail B being significantly lower. Therefore, the results of this study support the suggestion of neuropsychological problems among high stress Prisoners of War.

Sutker et al. (1990) indicated that cognitive functions such as memory among POWs were impaired by trauma. They selected three groups of subjects including 60 POWs with more than 35% weight loss, 113 POWs with less than 35% weight loss and 50 combat control subjects. All subjects were administered the Revised Wechsler Adult Inteligence Scale (WAIS-R), and the Logical Memory indices of the Wechsler Memory Scale (WMS) (in two conditions, immediate and 30-minutes delayed recall). The results showed that the three groups differed significantly across the sub-tests of the WAIS-R. Former POWs who reported loss of more than 35% of their preconfinement weights showed significantly less proficient performances than did combat veterans on: the WAIS-R performance IQ summary score, Arithmetic, Similarities, and Picture Completion sub-tests, and an the Attention-Concentration scale. They were deficient relative to their low weight-loss counterparts on Arithmetic and on the Attention-Concentration factor. Former POWs with low weight loss did not differ significantly from the combat controls on any of the WAIS-R items. In terms of memory function, former POWs with high weight loss performed more poorly on measures of immediate memory than did those in the low weight-loss group who were in turn less proficient than were combat veterans. POWs in the high weight group also performed more poorly than combat controls on the delayed memory items. Interestingly POWs with low weight loss performed similarly to combat controls, differing only on immediate recall. The authors concluded that deficits on immediate recall, Arithmetic, and Attention-Concentration Factor performances were most apparent among the high weight loss group, and this raises the possibility that memory problems may be more attributable to deficiencies in attention, concentration and perhaps organising function than to storage or retrieval processes.

Yehuda et al. (1995) studied memory functions including retroactive interference and found that patients with chronic combat-related PTSD may have fairly specific deficits in the monitoring and regulation of memory information. They selected 20 patients with PTSD and 12 comparison subjects, matched for sex, age, race, and years of education. All subjects were given a structured psychiatric assessment and a medical evaluation by an experienced physician. Comparison subjects with a past or current psychiatric history, according to the Schedule for Affective Disorder and Schizophrenia (SADS) criteria were excluded. Subjects with PTSD who met diagnostic criteria for a primary psychiatric disorder other than PTSD were also excluded. The subjects were tested for performance on measures of intellectual functioning using the Wechsler Adult Intelligence Scale (WAIS) and their memory performance was evaluated using the California Verbal Learning Test, in which a list of 16 words (list A) is presented five times in succession, and subjects are instructed to recall as many of the words as possible, in any order, after each presentation of the word list. After the five test trials of list A, a second list of words (list B), unrelated to the first list, is read to the subjects, who are instructed to recall as many words as possible from list B. The subjects are then asked to recall list A again (short delay) and, after a 20 minute interval, are asked to recall list A again (long delay). The resultant dependent variables are trial 1 performance (initial attention and immediate memory), trial 5 performance (cumulative learning), list B performance (active interference from previous learning), word recall following the short delay subtracted from the list A trial 1 performance (retroactive interference), and long delay recall (retention of information). The results demonstrated that the PTSD patients showed normal performance in the functions of initial attention and immediate memory, cumulative learning, and active interference from previous learning, but that they seem to have a circumscribed cognitive deficit, revealed by a significant decrement in retention following exposure to an intervening word list.

These results may be compatible with the idea that memory dysfunction in PTSD may involve the intermingling of past experiences with current experiences (e.g., intrusive thoughts or flashbacks). Thus, the data suggested that patients with PTSD may have fairly specific deficits in the monitoring and regulation of memory information.

Gil et al., (1990) evaluated cognitive deficits in PTSD patients by means of objective tests. Twelve PTSD patients, 12 psychiatric controls, and 12 normal subjects participated. In both patient groups, none of the subjects had undergone electroconvulsive therapy or psychosurgery and none had a history of significant head trauma. The tests that were used in this study included Intelligence tests (Wechsler Adult Intelligence Scale and Army IQ Test), tests sensitive to organicity (Mental Control from the Wechsler Memory Scale, The Bender-Gestalt Test and the Benton Visual Reproduction Test), Verbal Fluency Tests, Attention (Objective Vigilance Measure & Subjective concentration and Attention), and

Memory Tests including Verbal and Nonverbal Memory, Remote Memory and Subjective Memory Tests. One examiner administered all the tests in two sessions with a 10 minute break between them. The results of this study showed that the PTSD subjects had a basic impairment of cognitive functioning in comparison with the control group, but that the two patient groups were indistinguishable on most of the cognitive measures except the verbal Fluency test on which PTSD patients were appreciably ($p < 0.007$) more impaired than psychiatric controls when producing words starting with a given letter (B).

Bremner et al., (1993) compared short-term memory function in patients with combat-related PTSD (N = 26) who were matched for age, sex, education, handedness and other factors that could affect memory function, with a group of control subjects (N=15). A neuropsychological battery including: four sub-tests of the WAIS-R (Arithmetic, Vocabulary, Picture Arrangement, and Block Design), two sub-tests of the WMS (Logical memory or Verbal memory and Visual memory), and two components of the Selective Reminding Test (Verbal and Visual sub-tests) were used in this study. The hypothesis was that the scores on the scales for measuring memory function would be lower for the PTSD patients than for the comparison subjects. The results indicated that both groups of subjects had similar intelligence levels. The PTSD patients scored significantly lower on the WMS logical memory (verbal) component measures for immediate and delayed memory. Scores on the visual memory component of the WMS were slightly lower in the patients with PTSD than the comparison group, although the difference was not significant. The PTSD patients also scored significantly lower than the comparison subjects on most of the measures for the Verbal and Visual sub-tests of the Selective Reminding Test. The patients had significantly lower scores on the total recall, long-term retrieval, long-term storage and delayed recall measures of the Verbal component and on the total recall, continuous long-term retrieval, and long-term storage measures for the visual component. The authors concluded that the PTSD patients displayed memory problems comparable to those of other clinical populations with clearly documented temporal lobe damage and hippocampal involvement. Their finding of 67% retention on the logical memory component of the WMS is comparable to the

53% retention level in patients with left temporal lobe epilepsy and 74% in patients with right temporal lobe epilepsy previously observed (1980), while their comparison subjects' performance was comparable both to the performance of the comparison subjects in that study and to normative data.

A neurologic "hypersensitivity phenomenon" hypothesis had been advanced by Everly (1987, 1989). In this theory high intensity neural stimulation is postulated to lead to a subsequent hypersensivity for neurological excitation existing within the limbic circuitry. Therefore, the hypothesis suggests that there is a heightened sensitivity for excitation in the neural circuits of the limbic system. It seems that this hypersensivity could cause a wide range of psychological dysfunctions which would be consistent with disturbance of brain structures which play a basic role in memory (e.g, hippocampus). Everly and Horton (1989) studied 14 patients with PTSD who were administered the Four-Word Short-term Memory Test (Langhinrichsen & Horton, 1988). The test requires the examiner to read four unrelated words and then say a three-digit number for an interval of 15 or 30 sec. At the end of that interval, the subject repeats the to-be-remembered material. In total, 10 or 12 trials, equally divided between the two time intervals, are administered. The score is the percentage of total words correctly recalled. Preset normative criteria were 55% correct on the 15 sec. trial and 45% correct on the 30 sec. trial. The results suggested that 12 of 14 patients were impaired on one of the two criteria. For the 15-sec. interval, 9 of the 14 and for the 30-sec. interval, 11 of the 14 patients appeared impaired. Additional analysis suggested that the cognitive impairment did not reflect age-related short-term memory deficits. The postulation of Everly (1989) was that PTSD is a condition of limbic system hypersensitivity and instability. A correlate is that PTSD patients would show memory impairment which would support Everly's (1989) hypothesis.

Sutker et al., (1991) conducted a study to compare POW survivors with appropriate samples of combat veterans who have seen similar military duty using measures of problem-solving functions, personality characteristics, mood states, and psychiatric clinical diagnoses. The participants were 22 Korean conflict POW survivors and 22 veterans who had seen similar combat but had not been taken captive. The assessment protocol included the WAIS-R, the Logic Memory sub-test of the WMS, the MMPI, the Beck Depression Inventory and the State-Trait Anxiety Inventory. The results indicated that the POW survivors and combat groups were similar in background characteristics, but that the POW survivors had shown greater problems in adjustment and daily functioning, encompassing physical, emotional, and behavioural domains, than the combat veteran control group. The POW subjects performed more poorly than the combat veterans on the WAIS-R problem-solving measures, but the differences did not achieve significance using a Bonferroni procedure on the full scale scores. The POW survivors performed less proficiently than the combat veterans on the WMS indices overall. In sum, POW survivors were deficient relative to combat veterans of similar ages and education characteristics on the WAIS-R and WMS tests of cognitive performance, showing significantly poorer performance on tasks that require attention, concentration and memory.

Finally Bremner et al. (1995) recruited 26 Vietnam veterans with a history of combat-related PTSD and 22 comparison subjects matched for age, sex, race, handedness, height, weight, years of education, socioeconomic status, and years of alcohol abuse. The purpose of this study was to compare the hippocampal volume of patients with PTSD to that of subjects without any psychiatric disorder. Magnetic Resonance Imaging (MRI) was used to measure the volume of the hippocampus. Verbal memory was assessed with the logical component and visual memory with the figural component of the WMS, with percent retention calculated as delayed recall divided by immediate recall multiplied by 100. The results revealed that PTSD patients had a statistically significant smaller (8%) right hippocampal volume relative to that of the comparsion subjects, while there was no difference in the volume of other brain regions (Caudate and temporal lobe). PTSD patients also showed deficits in short-term verbal memory which were associated with smaller right hippocampal volume. These findings are consistent with a smaller right hippocampal volume in PTSD that is associated with functional deficits in verbal memory.

In summary, the results of these studies using neuropsychological assessments have revealed that PTSD patients suffer from memory dysfunctions, particularly verbal memory which seems to be related to brain morphology. Recent researchers postulate that the memory deficits in PTSD patients are associated with right hippocampus morphology (Nadel and Jacobs, 1995; Bremner et al., 1995; Rauch et al., 1995).

8.3 Memory dysfunction in children and adolescents with PTSD

As with adults, traumatised children exhibit a spectrum of psychological consequences, including altered attentional processes, deficits in cognitive systems necessary for learning, inefficient memory systems, deficits in affective responsiveness, and so on (see Chapter 2).

There are very few research studies of neuropsychological aspects of children who suffer from PTSD. Recently Palmer (in press) carried out research on neuropsychological functioning of 60 females who were between the ages of 7 to 12 years using a neuropsychological battery and a set of history questionnaires. Thirty of the girls had a known history of sexual abuse and the comparison group did not. The hypothesis of this study was that "there are neurodevelopmental adaptations in the chronically traumatised child which can negatively impact academic performance". The neuropsychological battery consisted of tests of memory and learning, the Rey-Osterrieth Complex Figure, the Test of Variables of Attention, the Wisconsin Card Sorting Test, and the Wechsler Intelligence Scale for Children-III, Arithmetic, Vocabulary, Picture Arrangement, Similarities and Block Design sub-tests. The results showed that the traumatised group differed on neuropsychological function including memory, attention, higher cognitive functions and freedom from distractibility relative to the control group. Furthermore, it was hypothesised that the severity of the neuropsychological deficit is a function of the age of onset of traumatisation and severity of abuse. Finally the results of this study revealed a right hemispheric specialisation in children who suffer from traumatic events.

8.4 Purpose of research

The main aim of the present study was to investigate memory functions in child patients with PTSD using a standard neuropsychological memory test which is unrelated to the trauma-content, to see whether memory problems in young people with PTSD reflect a general cognitive deficit.

8.5 Hypothesis

Children who suffer from PTSD will show a significant memory deficit on a standard neuropsychological test (i.e., the Rivermead Behavioural Memory Test) which is unrelated to the trauma, compared with normal control subjects.

8.6 Subjects

Eighteen children and adolescents aged 11 to 17 who met Diagnostic and Statistical Manual of Mental Disorders (3rd Edition, DSM III-R; American Psychiatric Association, 1987) and International Classification of Diseases (World Health Organization, ICD-10, 1992) criteria for PTSD were matched on age, sex, and verbal IQ with 22 children and adolescents without any psychiatric problems. All PTSD subjects were involved in road traffic or personal violence accidents. Most of the children patients were recruited from the Children's Department of the Mausdely Hospital, who had been seen by Prof. W. Yule. A few subjects were identified from other clinics in London or out of London. Of the 18 PTSD subjects, 8 were boys and 10 girls with a mean age of 171.33 months (SD = 24.43). Most of the control group were recruited from secondary schools and a few of them from primary schools from different parts of London. Of the 22 normal subjects, 12 were boys and 10 girls with a mean age of 172.00 months (SD = 17.51).

8.7. Materials

8.7.1. Psychological measures

1- ***Revised Impact of Event Scale*** (IES, Horowitz, 1979).

2- ***Revised Children's Manifest Anxiety Scale*** (RCMAS; Reynolds & Richmond, 1978).

3- ***Depression Self-Rating Scale*** (DSRS, Birleson, 1981).

4- ***British Picture Vocabulary Scale*** (BPVS short form, Dunn et al., 1981).

5- ***Wechsler Objective Reading Dimensions*** (WORD, Basic Reading, Rust et al., 1993).

For details of all psychological measures see Chapter 4.

8.7.2. The Rivermead Behavioural Memory Test (RBMT)

The test which was used in this study is the Rivermead Behavioural Memory Test (RBMT), which was developed by Wilson, Cockburn, & Baddeley (1989) as a procedure to assess everyday memory problems. According to its authors, this test is a bridge between laboratory-based measures of memory and assessments obtained by questionnaire and observation. The main aim of this test is to provide analogues of everyday memory situations that appear to be vexatious for certain patients with memory problems. It avoids some of the weakness of questionnaires, rating scales, and checklists particularly for people with brain injury and poor memory as well (Wilson et al., 1989). The test also provides a good estimate of every day memory problems (Wilson, Cockburn, Baddeley & Hiorns, 1989) and is useful for a wide age range of range (5 to adult). An important feature of the RBMT is that it does not attach to any particular theoretical model of memory and it administrable in 30 to 40 minutes.

Reliability of the test is very good; for example, the correlation between performance on parallel forms (version A, B, C, & D) on the Screening Score are .84, .80, & .67 respectively. Considering data from all 118 patients who were tested twice, the correlation between the two scores was .78 for the screening score & .85 for the profile score (Wilson et al. 1989). Validity of the RBMT was obtained by correlating performance on this test with performance on a number of standard memory tests (e.g. the Warrington Recognition Memory Test for words and face, digit span, spatial span using the corsi block technique etc.).

The RBMT contains from 12 different subtests that cover verbal, visual and visuo-spatial memory in immediate, delayed and prospective conditions. This test emphasises skills that are needed in real-life situations. The sub-tests of the RBMT are as follows:

1 & 2- Remembering a name (first name 1 & second name 2):

The subject is shown a portrait, told the person's name, asked to repeat it and told they will be asked to recall the name later.

3-Remembering a hidden belonging: Something is requested from the subject, and placed in a specific place while he/she watches. The subject is required to ask for the belonging and to remember the place when the examiner says "We have now finished this test".

4-Remembering an appointment: A timer is set for 20 minutes. The subject is told that, when the timer rings, he/she should ask about his/her next appointment.

5-Picture recognition: The subjects are shown 10 pictures one at a time. After a delay of a few minutes subjects are shown 20 pictures (the original 10 plus 10 distractors) one at a time and have to say whether or not they have seen each picture before.

6-Remembering a newspaper article (immediate and delayed recall): A short prose passage is read to the subject for immediate and delayed (20 minutes) recall.

7-Face recognition: 5 photographs are shown one at a time. Later 10 photograph are shown (the original 5 plus 5 distractors) one at a time. The subject has to say whether or not he/she has seen each photograph before.

8-Remembering a new route (immediate): The examiner traces a short path between a series of specified locations in the room. The subject is asked to trace the same path.

9-Remembering a new route (delayed): After a 10 minutes delay the subject is again asked to remember and trace the new route.

10-Delivering a message: When the examiner traces the path around the room, he/she leaves an envelope marked "message" at a specified location. The subject is required to pick up the envelope and leave it in the right place on both immediate and delayed routes.

11-Orientation: 9 different questions about time and place are asked as orientation. The questions are as follow:
(a) what year is it now? (b) what month is it now? (c) what day of the week is it today?

(d) in what place we are in now? (e) in which city or town we are in now? (f) how old are you? (g) in what year you were born? (i) what is the name of the present Prime Minister of Great Britain? (j) what is the name of the present President of the USA?

12-Date: The subject is asked to say the date.

8.7.2.1. The Standardised Profile Score

There are two ways for scoring the RBMT, standardised score and screening score. In the screening score, each item is scored pass (1 point) or fail (0 points) and the maximum number of points is 12 obtained from 12 items. In the standardised score, each item is allocated 2 points for normal and complete responses, 1 point (borderline) and 0 points for abnormal responses. The points derive from a raw profile score.Table 8.1 shows the standardised profile scores of RMBT items and the ranges of raw scores they derive from.

Table 8.1 Standardised Profile Scoring for the RBMT (Raw Scores are indicated in the body of the table)

Item	2 points	1 points	0 points
1st & 2nd name	4	3	0-2
Belonging	4	3	0-2
Appointment	2	1	0
Pictures	10	9	0-8
Immediate route	5	4	0-3
delayed route	5	4	0-3
Message	6	5	0-4
Orientation	9	8	0-7
Date	correct date	1 day out	2 or more days out
Faces	5	4	0-3
Immediate Story	6 or more	4-5.5	3.5 or less
Delayed story	4 or more	2-3.5	1.5 or less

8.7.2.2. Interpretation of the scores

For each subject, two scores, a simple pass/fail or Screening Score, and a standardised Profile Score are produced. Standardisation of the Profile Score is necessary since the Raw Scores vary from one item to another. This means that if Raw Scores are added to make a total, then some components receive a much heavier weighting than others. Standardisation equates the importance of each item by giving it a maximum weighting of 2. The Screening Score ranges from 0-12, and the Standardised Profile Score ranges from 0-24. Tables 8.2 and 8.3 show the cut-off points for level of memory function on the RBMT for different groups of ages.

Table 8.2 Cut - off points for level of memory function on the RBMT for 11 - 14 year old children (Wilson et al., 1991)

	Normal Range	Borderline Range	Abnormal Range
Screening Score	9 - 12	6 - 8	0 - 5
Standardised Profile	20 - 24	15 - 19	0 - 14

Table 8.3 Cut - off points on the RMBT for adults from 16 - 69 years (Wilson et al., 1989)

	Normal	Poor memory	Moderately Impaired	Severely Impaired
Screening Score	10 - 12	7 - 9	3 - 6	0 - 2
Standardised Profile Score	22 - 24	17 - 21	10 - 16	0 - 9

8.8. Procedure

The test was carried out individually, and the subject was asked to sit in front of the experimenter behind a table in a silent room, without any disruptions. The subject was asked to listen to the questions carefully and then answer the questions. After ensuring that the test was clear to the subject, the test was started by the experimenter. Following completion of the test, subjects filled out the self-report measures. The test lasted about 20 - 25 minutes.

8.9. Results

8.9.1. Subject characteristics

Means and standard deviations were calculated separately for each group on various measures of psychopathology for patient and control groups (see Table 8.4). One way Analysis of varience (ANOVA) showed that there were no significant differences between the groups for age and verbal IQ (Appendix 8-1), but the clinical group scored significantly higher on the measures of depression [DSRS; $F (1, 38) = 9.82$, $P = .0047$] and anxiety [RCMAS; $F (1, 38) = 5.23$, $P = 0.02$]. PTSD patients also obtained high score on the Impact of Event Scale consistent with Yule et al.'s studies of child survivors of shipping disasters (Yule et al., 1992). Interestingly, there was a highly significant difference between the two groups in reading ability as measured in WORD scores [F (1, 38) = 8.90, P = 0.005] with the normal control subjects scoring higher than the PTSD patients on this scale.

Table 8.4 Means and standarddeviations (SD) of the psychological measures for PTSD patients and controls

	PTSD (N=18)		NORMAL (N=22)		
	MEAN	SD	MEAN	SD	
AGE (months)	171.53	24.43	172.23	17.51	
WORD	94.17	17.65	107.73	10.85	**
BPVS	97.67	14.90	95.14	10.89	
DSRS	15.11	7.26	9.90	10.06	*
RCMAS	17.06	6.70	12.50	5.90	*
IES-TOTAL	37.18	20.06	-	-	
INTRUSION	17.00	9.70			
AVOIDANCE	20.18	11.21			

IES = Revised Impact of Event Scale including Avoidance and Intrusion Subscales, RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary, WORD (Basic Reading) = Wechsler Objective Reading Dimensions. * = P < 0.05 & ** = P < 0.01

8.9.2. RBMT data

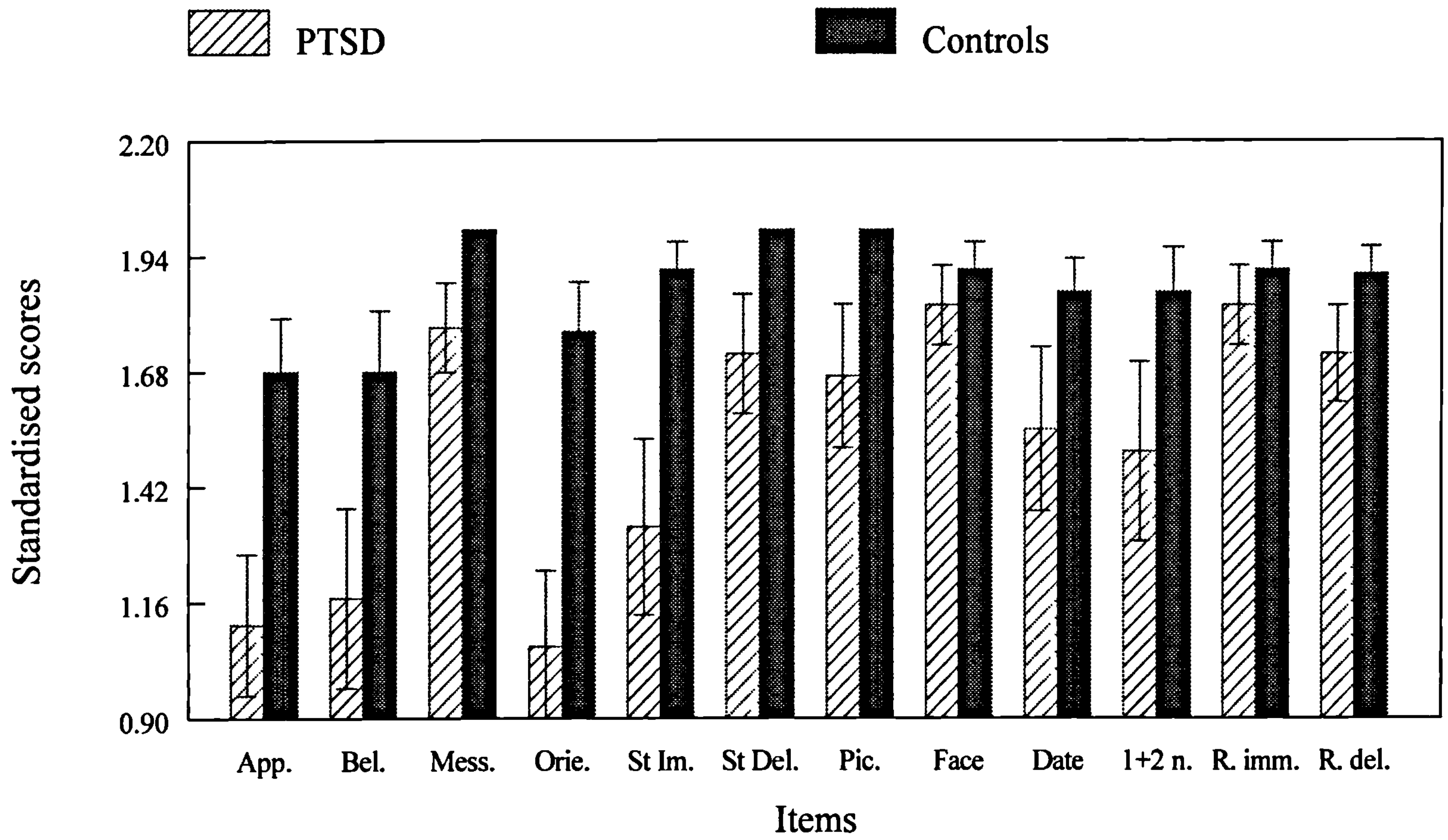
First of all, standardised profile scores for all sub-tests of the RBMT for each group of subjects separately were calculated. To analyse the data, t-tests for each item across the two groups of subjects i.e. PTSD and normal control were used. This way of analysing the data using multiple t-tests is taken from the previous literature (Wilson et al., 1989). Table 8.5 and Figure 8.1 show the mean, standard deviation, t value and significance levels for all sub-tests across both groups.

Table 8.5 Means Scores (M) and Standard Deviations (SD) for Control subjects and PTSD Patients on the Rivermead Behavioural Memory Test (RBMT)

RBMT items	CONTROLS		PATIENTS			
	M	SD	M	SD	*t* value	*p*
Names	1.86	0.47	1.50	0.86	1.61	n.s.
Belonging	1.68	0.65	1.17	0.86	2.17	*
Appointment	1.68	0.57	1.11	0.68	2.90	**
Pictures	2.00	0.00	1.67	0.69	2.06	n.s.
Immediate Route	1.91	0.29	1.83	0.38	0.71	n.s.
Delayed Route	1.90	0.29	1.72	0.46	1.49	n.s.
Message	2.00	0.00	1.77	0.43	2.20	*
Orientation	1.77	0.53	1.05	0.72	3.61	**
Date	1.86	0.35	1.55	0.78	1.55	n.s.
Faces	1.90	0.29	1.83	0.38	0.71	n.s.
Immediate Story	1.91	0.29	1.33	0.84	2.77	*
Delayed Story	2.00	0.00	1.72	0.57	2.05	*
Profile Total	22.41	1.89	18.50	2.55	5.56	**
Range	18-24		14-23			

* = $P < 0.05$, ** = $P < 0.01$

Figure 8.1. Mean of standardised scores on all items of RBMT



App=Appointment; Bel=Belonging; Mess=Message; Ori=Orientation; St im=Story immediate; St Del= Story Delayed; Pic= Picture; 1+2n=1st & 2nd name; r.imm.=Route immediate; R.del.=Route delayed

Data analysis for each sub-test is as follows:

8.9.2.1. First name and Second name

A one way ANOVA was performed between the two groups for the 1st and 2nd name items. The result showed that there were no significant differences between the two, groups [F (1, 39) = 2.91, P = .096], which was confirmed by a t-test [df (39) = 1.61, P = .119] for unequal variance (in a one way ANOVA when the level of significance on tests for homogeneity of variance is less than 0.05, we should employ a t-test for unequal variance). Therefore, both groups performed in the same way on this item.

8.9.2.2. Face Recognition

One way ANOVA showed that there was no difference between patients and normal control subjects on the Object Recognition sub-test [F(1, 39) =.50, P = .48] which shows PTSD patients performed as well as normal subjects.

8.9.2.3. Route Immediate and Delayed

A Repeated Measures ANOVA was carried out across two items i.e. Route Immediate and Delayed between PTSD patients and the comparison group. The results indicated that there was no main effect of group [F(1, 38) = 1.89, P = .177] nor a Group x Delay interaction [F(1, 38) = .80, P = .376]. The results of one way ANOVAs for route delayed [F(1,39) = 2.42, P = .13] and for route immediate [F(1, 39) = .50, P = .48] also confirmed this finding. Hence, again on these items, patients performed as well as control subjects.

8.9.2.4. Picture Recognition

A one way ANOVA was performed with this item to compare the two groups. The results revealed a significant difference between the two groups [F(1,39) = 5.22, P = 028], which was almost confirmed by the results of t-test for independent sample t-test [t (39) = 2.06, P = 0.055]. This finding indicated that the PTSD subjects had somewhat poorer memory for recognising the pictures than the control group.

8.9.2.5. Story Recall (Immediate and Delayed)

A one way ANOVA revealed a significant difference between PTSD patients and normal control subjects on Story Immediate [$F(1,39) = 9.02$, $P = 0.0047$] and Story Delayed Recall [$F(1, 39) = 5.17$, $P = 0.029$]. The Levene Tests for Homogeneity of Variance in both analyses were significant; therefore, to confirm the results t- tests for independent samples were performed for the two variables between the PTSD and normal control groups. The results supported the previous finding for Immediate Recall [$t (39) = 2.77$, $P = 0.012$] and the result was nearly significant for Delayed Recall [$t (39) = 2.05$, $P = 0.056$].

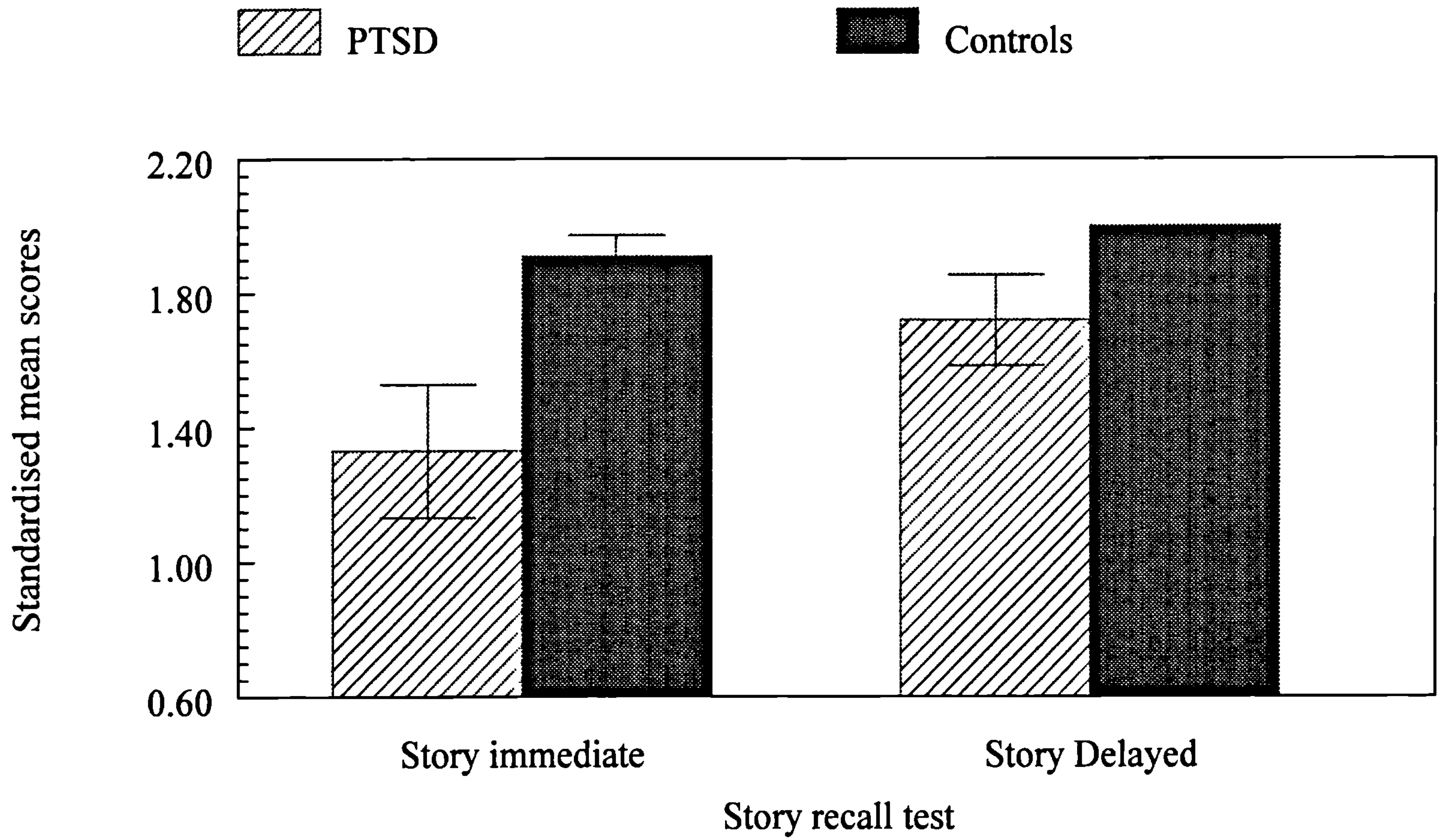
The story Recall (version 1) consists of 21 items. Hence, in both the immediate and delayed recall conditions, each subject has two raw scores. One way ANOVAs were carried out with the raw scores between the two groups. The results were significant for both Immediate [$F(1, 39) = 11.99$, $P = 0.001$] and Delayed [$F(1, 39) = 24.43$, $P < 0.001$] Recall. The findings revealed that the PTSD subjects had relatively poor memory for verbal material. These findings are consistent with the results of the Recall and Recognition test (Chapter 6) and also with other findings related to memory (Zeitlin and McNally, 1991). Figure 8.2 shows standardised scores for both groups i.e. PTSD patients and normal control.

8.9.2.6. Orientation

One way ANOVA showed a significant difference between the two groups on the Orientation standardised profile score [$F(1, 39) = 13.06$, $P = 0.0009$]. This result showed that the PTSD subjects performed in a different way overall on this item compared with the normal control subjects.

To break this down with respect to the different orientation questions, a series of independent sample t- test was carried out to compare the two groups. The results indicated that there was a strong significant difference between PTSD patients and normal control subjects in responding to the last question i.e. "What is the name of the

Figure 8.2. Mean of standardised score on the story recall (Delayed recall)



present President of USA"? [t (1, 39) = 3.10, P = .005] which means that the patients with PTSD made more mistakes than the comparison group. The patient group also made more mistake on " what day is today"? than the control subjects, but the result did not reach statistical significance [t (1, 39) = 1.84, p = .083].

8.9.2.7. Date

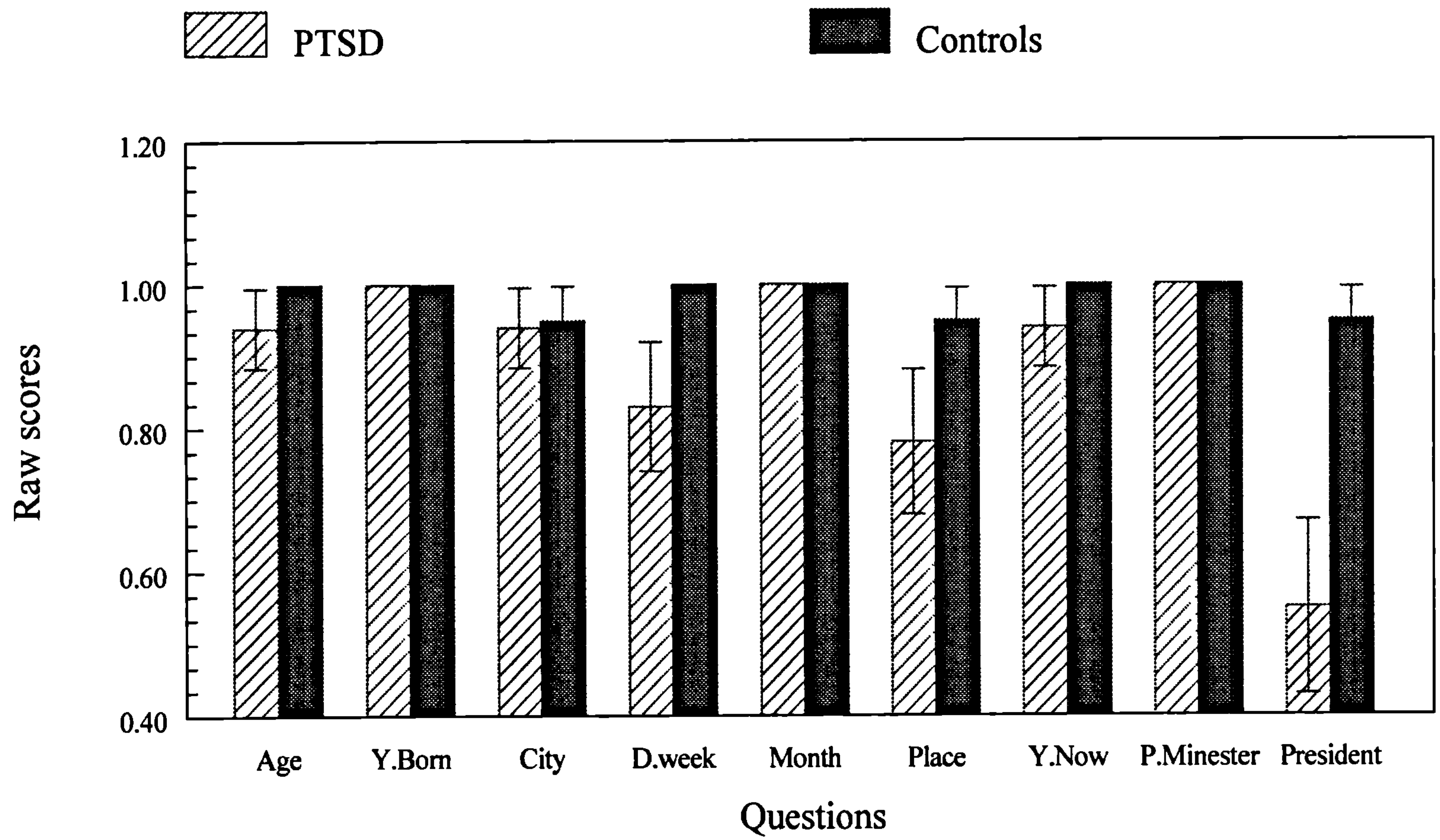
Patients with PTSD performed as well as the control group on responding to the date (what date is it today?) [F(1, 39) = 2.739, P = .1062]. Along with the results of the questions which related to time in the Orientation sub-test, such as recognising the day of the week or year of the birth, this suggests that PTSD patients had no any time orientation difficulties. Figure 8.3 shows raw scores for two groups of subjects.

8.9.2.8. Prospective Items (Appointment, Belonging and Message Delivery)

Prospective memory is memory for actions to be performed in the future such as remembering to return a library book, remembering to give someone a message, or remembering to pick up the children at school. Prospective memory contrasts with retrospective memory which is concerned with remembering information acquired in the past. Most memory assessment and research has been concerned with retrospective memory, using techniques such as recall or recognition to find out what information people can remember from the very recent or the more distant past.

Three items from the RBMT are related to prospective memory and refer to future, remembering at the end of the session to ask for a personal possession which was put away at the begining of the session; remembering when an alarm rings to ask a specific question given when the alarm was set 20 minutes earlier; and, finally, remembering to ask for a message on the route round the room and deliver it at a specific point along the route (Cockburn, Wilson, Baddeley, and Hiorns, 1990). One way ANOVAs revealed that there were strong significant differences between the two groups (i.e. PTSD and normal control subjects) on all three prospective items {[F(1, 39) = 8.42, P = .0061] for Appointment standardised profile score; [F(1,39) = 4.63, P = .0366] for Belonging standardised profile score; and [F (1, 39) = 5.97, P = .0193] for Delivery standardised

Figure 8.3. Mean of raw scores on the Orientation Questions

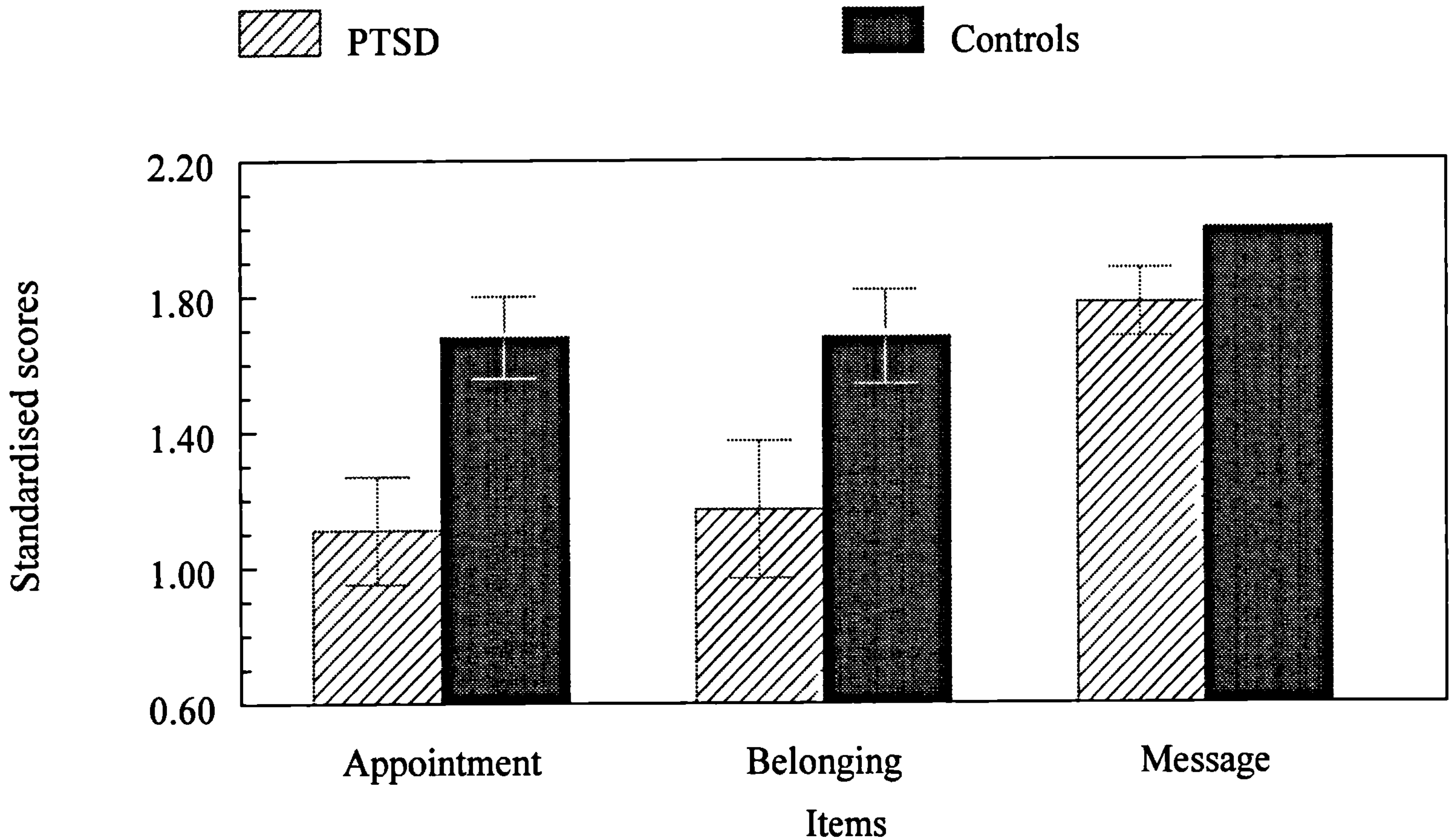


score}, Levene Tests for homogeneity of variance were significant (P <0.001) for Message Immediate and Delayed standardised profile scores. The result of an independent sample t-tests (for unequal variances) for this last item, however, confirmed the findings [t(39) = 2.20, P = .042].

To analyse prospective action in general a compound variable was computed by adding the standarised profile scores of the three items which related to prospective memory. One way ANOVA was performed between the two groups for this variable. The result indicated that there was a strong difference between the two groups with PTSD patients performing worse than normal subjects on this task [F(1,39) = 12.86, P = .0009 with the Levene Test significant (0.028)]. To confirm this finding an independent sample t-test was carried out between the two groups. The result confirmed the previous finding [t (39) = 3 .44, P = .002].

These findings show that the PTSD subjects present with a relative deficit in prospective memory items compared to the normal control subjects. Figure 8.4 showes standardised scores of Prosepective memory items in PTSD patients and normal controls.

Figure 8.4. Mean of standardised scores on the items of prospective memory



8.9.2.9. Total Standardised Profile Score

Previous studies have revealed that different types of patients with memory problems such as brain damage (Wilson et al., 1989) showed severe deficits in performing on the RBMT total scores. To compare the present two groups of subjects on the total scores, a one way ANOVA was carried out between PTSD patients and normal control subjects. The results showed a highly significant difference between the two groups [$F(1, 39) = 30.94$, $P < 0.001$] which indicated that the PTSD patients have a deficit in general memory. This finding is consistent with the clinical features of PTSD concerning memory problems. Distribution of memory scores (Table 8.6 and Figure 8.5) indicated that 55.6% of child PTSD patients suffer from poor memory according to RBMT norms and 22.2% also had impaired memory. This means that 77.8% of PTSD subjects had memory problems, while only 22.2% showed a normal memory. In contrast only 13.6% of control subjects presented with poor memory and none with impaired memory. Table (8-7) and shows the cumulative distribution, percentage, frequency of memory levels for PTSD patients and normal control subjects.

Table 8.6 Distribution of scores with respect to standardised RBMT memory levels among PTSD patients and normal control subjects

	PTSD			CONTROL	
	Normal	Poor	Impaired	normal	Poor
Value	1	2	3	1	2
Frequency	4	10	4	19	3
Percentage	22.2	55.6	22.2	86.4	13.6
Cumulative percentage	22.2	77.8	100.0	86.4	100.0

Figure 8.5. Mean of total standardised scores of RBMT

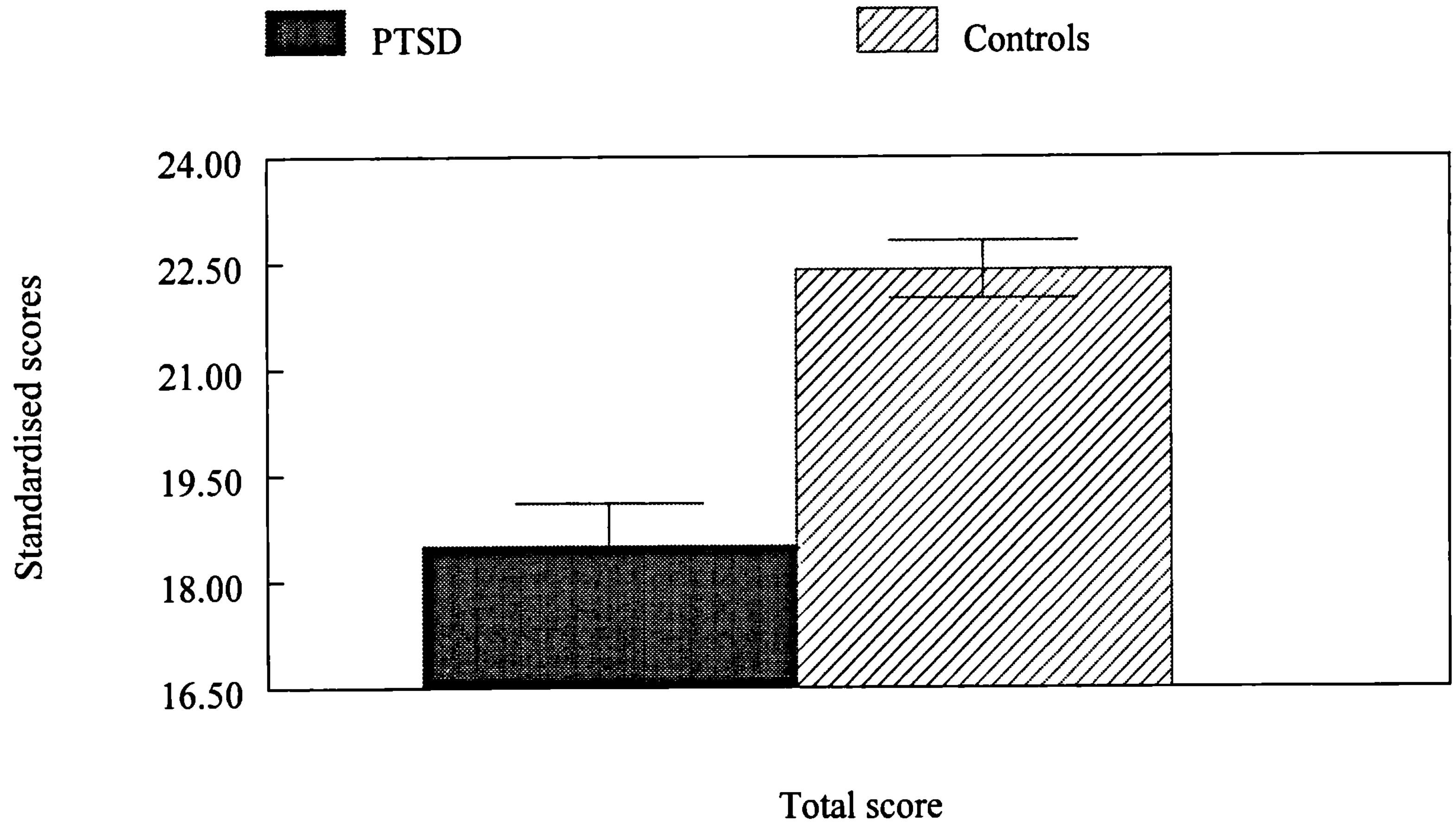


Table 8.7 Cumulative percentage distributions of the total standard profile and screening scores for the RBMT in the two groups (PTSD & controls)

STANDARDISED SCORE			SCREENING SCORE		
VALUE	CONTROL	PTSD	VALUE	CONTROL	PTSD
14		11.1	5		11.1
15		16.7	6		16.7
16		22.2	7	9.1	33.3
17		33.3	8	13.6	50.0
18	9.1	44.4	9	13.6	72.2
19	13.6	50.0	10	31.8	94.4
20	13.6	83.3	11	63.6	100.0
21	18.2	94.4	12	100.0	
22	40.9	94.4			
23	63.6	100.0			
24	100.0				

8.9.2.10. Type of Trauma Effect

Means and standard deviations were calculated separately for each group of patients i.e. RTA and PV on various measures of psychopathology (Table 8.8). One way ANOVAs showed that there were no significant differences between the two sub-groups for verbal IQ, reading ability, anxiety, and Impact of Event Scale (Appendix 8.2), but the PVgroup scored significantly higher on the DSRS [F(1, 16) = 10.54, P = 0.005] than the RTA group. The PVgroup was also significantly older than the RTA group [F(1, 16) = 11.67, P = 0.0038].

Table 8.8 Means and standard deviations (SD) of psychological scales for the two sub-groups of PTSD patients (i.e. RTA & PV)

	RTA (N = 9)		PV (N = 8)		
	MEAN	SD	MEAN	SD	
AGE (months)	155.22	24.13	186.87	10.66	*
WORD	100.67	13.09	90.75	18.82	n.s.
BPVS	102.67	12.83	95.50	14.19	n.s.
DSRS	11.00	4.92	20.25	6.78	*
RCMAS	14.22	6.89	20.12	5.89	n.s.
IES	32.44	16.06	42.50	23.74	n.s.
AVOIDANCE	17.67	10.22	23.00	12.28	n.s.
INTRUSION	14.78	7.12	19.50	11.99	n.s.

IES = Revised Impact of Event Scale, RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary Scale, WORD (Basic Reading) = Wechsler Objective Reading Dimensions * = P < 0.01

One way ANOVAs between the two sub-groups of patients who suffered from different types of traumas i.e. personal violence or road traffic accident, showed that there were no significant differences between the two sub-groups on all sub-tests of the RBMT (Appendixes 8.3). These results indicated that the two sub-groups performed in the same way on the memory task.

8.9.2.11. Preliminary Developmental analyses

Is the general memory performance in young people with PTSD affected by developmental aspects? To examine this point, all subjects were divided into two sub-groups, those below 14 years old and those over 14 years old. Subject characteristics for both sub-groups of patients and controls are shown in Tables 8.9 and 8.10.

8.9.2.11.1. Children (under 14 years old)

One way ANOVAs showed that there were no significant differences between the two groups (aged under 14 years) on age, verbal IQ, reading ability, self reported anxiety, or depression (Appendix 8.4).

Table 8.9 Means and standard deviations (SD) of psychological measures for the two child sub-groups i.e. PTSD and normal subjects (aged under 14 years old)

	PTSD (N = 6)		NORMAL (N = 8)		
	MEAN	SD	MEAN	SD	
AGE (months)	141.00	13.46	152.87	9.48	n.s.
WORD	99.33	9.73	108.87	15.10	n.s.
BPVS	99.83	12.75	98.00	11.55	n.s.
DSRS	11.33	3.98	10.50	4.75	n.s.
RCMAS	15.17	3.87	12.12	6.27	n.s.

RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary Scale, WORD (Basic Reading) = Wechsler Objective Reading Dimensions

One way ANOVAs between the two groups of subjects (i.e. PTSD & normal control under 14 years old), showed that there were no significant differences between the two sub-groups for all sub-tests of the RBMT (Appendix 8.5) except story immediate recall [$F(1, 13) = 11.56$, $P = 0.005$] and the total score of the memory test [$F(1, 13) = 13.11$, $P = 0.0035$]. PTSD patients scored significantly lower on story immediat recall (mean = 0.833, SD = 0.983 for PTSD and mean = 2, SD = 00 for controls) and on the total score of the RBMT (mean = 18.17 SD = 2.32 for PTSD and mean = 22.25, SD = 1.91 for controls) than normal control subjects.

8.9.2.11.2. Adolescents (over 14 years old)

One way ANOVAs indicated that there were no significant differences between the two adolescent sub-groups (aged over 14 years) on age and verbal IQ (Appendix 8.6), but significant differences on self-reported depression [$F(1, 25) = 11.30$, $P = 0.0026$], and reading ability [$F(1, 25) = 6.84$, $P = 0.015$] were found. A non-significant trend was also found between PTSD patients and normal controls on the self-reported anxiety [$F(1, 25) = 3.91$, $P = 0.06$].

Table 8.10 Means and standard deviations (SD) of psychological measures for the adolescent sub-groups, i.e. PTSD and normal subjects (aged over 14 years old)

	PTSD (N = 12)		NORMAL (N = 14)		
	MEAN	SD	MEAN	SD	
AGE (months)	186.50	9.36	183.29	9.21	n.s.
WORD	91.56	20.41	107.07	8.13	**
BPVS	96.58	16.24	93.50	10.56	n.s.
DSRS	17.00	7.91	9.57	2.31	**
RCMAS	18.00	7.77	12.71	5.85	*

RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary Scale, WORD (Basic Reading) = Wechsler Objective Reading Dimensions. * = P < 0.1, ** P = <0.05

One way ANOVAs between the two groups of subjects (i.e. PTSD & normal controls over 14 years old), showed that there were significant differences between the two sub-groups on appointment [F(1, 25) = 5.37, P = 0.029], belonging [F(1, 25) = 5.24, P = 0.031], message delivery [F(1, 25) = 6.46, P = 0.018], orientation [F(1, 25) = 14.77, P = 0.0008], prospective memory [F(1, 25) = 12.56, P = 0.0016], and total memory [F(1, 25) = 17.24, P = 0.0004] aspects of the RBMT. Significant differences on date, face recognition, first name and second name, picture recognition, route delayed, route immediate, story delayed recall, or story immediate recall were not found (Appendix 8.7). In comparison with the results of the children, indicates that most of the differences between PTSD patients and normal controls are related to the older subjects. Table 8.11 shows mean scores and standard deviations on different items of the RBMT across adolescents with PTSD and normal controls.

Table 8.11 Means Scores (M) and Standard Deviations (SD) for PTSD and controls adolescents on the Rivermead Behavioural Memory Test (RBMT)

RBMT items	CONTROLS		PATIENTS		
	M	SD	M	SD	*p*
Names	1.86	0.53	1.58	0.79	n.s.
Belonging	1.71	0.61	1.08	0.79	*
Appointment	1.57	0.65	1.00	0.60	*
Pictures	2.00	0.00	1.58	0.79	n.s.
Immediate Route	1.93	0.27	1.83	0.39	n.s.
Delayed Route	1.93	0.27	1.75	0.45	n.s.
Message	2.00	0.00	1.67	0.49	*
Orientation	1.86	0.36	1.00	0.42	n.s.
Date	1.93	0.27	1.67	0.65	n.s.
Faces	1.86	0.36	1.75	0.45	n.s.
Immediate Story	1.86	0.36	1.58	0.67	n.s.
Delayed Story	2.00	0.00	1.83	0.37	*
Profile Total	5.29	1.35	3.75	1.29	**
Total Score	22-50	1.95	18-67	0.75	**

* = $P < 0.05$, ** = $P < 0.01$

8.9.2.12. Sex effect

Another question which still remains concerns whether the memory performance in young patients with PTSD is affected by their sex ? To examine this point, PTSD subjects were divided into two sub-groups: boys, and girls. Subjects characteristics for both sub-groups of patients are shown in Table 8.12.

Table 8.12 Means and standard deviations (SD) of psychological measures for boys and girls with PTSD

	BOYS (N = 8)		GIRLS (N = 10)		
	MEAN	SD	MEAN	SD	
AGE (months)	175.87	18.18	167.70	28.96	n.s.
WORD	94.37	17.26	94.00	18.89	n.s.
BPVS	95.87	17.03	99.10	13.66	n.s.
DSRS	13.50	5.48	16.40	8.49	n.s.
RCMAS	14.75	7.83	18.90	5.42	n.s.
IES	27.62	19.58	45.67	17.23	n.s.
AVOIDANCE	13.50	8.94	22.64	10.75	**
INTRUSION	13.10	9.94	18.64	9.08	n.s.

IES = Revised Impact of Event Scale including Avoidance and Intrusion Subscales, RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary Scale, WORD (Basic Reading) = Wechsler Objective Reading Dimensions. * = $P < 0.1$ & ** = $P < 0.05$

One Way ANOVAs showed that there were no significant differences between boys and girls on age, verbal IQ, reading ability, self-reported depression, self-reported anxiety, total scores on the Impact of Event Scale, or scores on the intrusion subscale, (Appendix 8.8), but the results indicated a non-significant difference on the avoidance sub-scale of the IES [$F(1, 16) = 4.01$, $P = 0.064$].

One way ANOVAs between boys and girls with PTSD showed that there were no significant differences between the two sub-groups on all sub-tests of the RBMT (Appendix 8.9) except on prospective memory items [$F(1, 17) = 6.33$, $P = 0.023$], particularly appointment [$F(1,17) = 5.09$, $P = 0.038$]. These results indicated that the boys exhibited reletively poor performance on prospective memory (mean = 3.25, SD = 1.28, for boys and mean = 4.70, SD = 1.16 for girls for prospective items, mean = 0.88, SD = 0.30 for boys and mean = 1.40, SD = 0.27 for girls on the belonging item).

8.9.2.13. Correlational Analyses

To find the relationships between age, verbal IQ, reading ability, depression, anxiety and scores on the Impact of Event Scale on the one hand and total scores or prospective item scores on the RBMT on the other hand, a series of correlations was performed across all subjects. The results are shown in Tables 8.13 and 8.14.

Table .8.8 Correlations between psychological measures and total memory and prospective memory scores across all subjects (N = 40)

	Total Memory Score		Prospective Memory Score	
	Correlation	P value	Correlation	P value
Age	0.06	0.71	-0.15	0.34
BPVS	0.09	0.58	0.16	0.33
DSRS	-0.43	0.006**	-0.37	0.02*
RCMAS	-0.22	0.178	-0.25	0.12
WORD	0.55	0.001**	0.39	0.014*

RCMAS = Revised Children's Manifest Anxiety Scale, DSRS = Depression Self-Rating Scale, BPVS = British Picture Vocabulary, WORD (Basic Reading) = Wechsler Objective Reading Dimensions.

* = P < 0.05 & ** = P <0.015

Table 8.9 Correlations between IES & total and prospective memory scores across PTSD patients (N = 18)

	Total Memory Score		Prospective Memory Score	
	Correlation	P value	Correlation	P value
IES	-0.15	0.55	-0.17	0.51
Avoidance	-0.18	0.48	-0.16	0.53
Intrusion	-0.11	0.68	-0.17	0.52

IES = Revised Impact of Event Scale including Avoidance and Intrusion Subscales

As the results indicate there were strong positive correlations between reading ability and total and prospective memory scores on the RBMT. This suggest that differences between the two groups might be a function of reading ability. There was also a negative correlation between depression scale and memory scores. This means that memory performance was effected by the level of depression. Finally there was no correlation between Impact of Event Scale, anxiety scale, or British Picture Vocabulary Scale and TBMT performance.

8.10. Discussion

The patients with PTSD in this study scored lower on the total score on the Rivermead Behavioural Memory Test (RBMT) compared to both control subjects and to the norms of the RBMT (Wilson et al. 1990, 1989) thus revealing a general poor memory in the PTSD patients. This result is consistent with Bremner et al's (1995) study showing a deficit of short term memory in adults with PTSD. Generally, this finding is in agreement with previous findings such as Goldestein et al. (1987), Sutker et al. (1988), Gil et al. (1990), Yehuda et al. (1995), Everly and Horton (1989), Sutker et al. (1991) [see review of studies to this Chapter]. All of these studies found that PTSD patients suffer from cognitive deficits and particularly memory deficits. Goldestein et al.(1987) found that 62% of their Prisoners of War (POWs) from World War II complained of memory and concentration impairments and Sutker et al. (1988) reported that 78% and 93% of POWs from World War II and the Korean War reported similar cognitive problems. Everly and Horton (1989) found that the majority of their 14 PTSD patients scored beyond a preset cut-off for neuropsychological impairment. These findings were supported by the current study's findings on total scores, as the majority of the PTSD patients in this study scored below cut-off for normal memory performance. The current data also supported Sutker et al.'s studies (1991) which found that POW survivors scored significantly poorer performance on subtests that require attention, concentration, and memory on the Wechsler Adult Intelligence Scale and the Wechsler Memory Scale.

The present results also are in agreement with Palmer's study with PTSD children (in press) which found that traumatised children had deficits on neuropsychological functions including memory, attention, and higher cognitive functions.

In terms of recall memory two items were used in this study: Story Immediate and

Delayed recall. The results showed that the PTSD patients scored significantly lower than the normal control subjects which is in agreement with the pattern of recall performance in the memory experiment reported in Chapter 7. In that experiment the PTSD patients recalled less words than control groups in all categories. These data are also in agreement with the findings from other studies: Gil et al. (1990) speculated that PTSD patients were considerably more impaired than normal controls and even psychiatric controls when producing words starting with a given letter -a function of verbal fluency-. They explain that this may suggest a specific speech problem in PTSD patients. Bremner et al. (1993) also found that PTSD patients obtained significantly lower scores on the Verbal Memory component of the Wechsler Memory Scale, i.e. 44% lower on immediate recall and 55% lower on delayed recall. In the current study PTSD patients remembered only 30% of the ideas in Story Immediate recall items while normal subjects remembered 44% which is significantly higher than for the patient group. In the Story Delayed recall item of PTSD patients recalled 22% which is also significantly lower than the control subjects' scores of 41%. These findings supported Gil et al's and Bremner et al.'s results about verbal memory. Interestingly PTSD patients also forgot significantly more words during Immediate and Delayed Story recall; i.e. PTSD patients forgot 8%, while normal subjects only forgot 3%. It is therefore possible to conclude that PTSD patients may have specific deficits in remembering the words which are related to verbal tasks. The results of the object Recognition item also showed a nearly significant difference between the two groups which is consistent with the story recall findings and with other findings from neuropsychological assessment of PTSD and suggests that the memory problems in PTSD are not confined to verbal material.

A possible explanation for the poor memory performance in PTSD patients is that deficits in concentration in PTSD patients are responsible (Bremner et al., 1993). It is not possible, on the basis of the present data, to say whether the problems underlying performance are attentional or mnemonic.

Regarding the Orientation item, PTSD patients were significantly different from normal subjects and semantic questions such as "what is the name of present President of the

USA?" seem more important than other types of question. This result is in agreement with Cockburn et al. (1990) who found the same problem in patients with dysphasia with the same material. In the current study the PTSD patients showed significantly lower performance on a reading test (WORD) than normal control subjects which is in the same direction as the dysphasic patients.

There was a strong significant difference between clinical and non-clinical subjects on the prospective items in present study. A typical prospective memory experiment would include three stages, to form an intention, retaining the content of the intention, and finally accomplishment of the action (Barba, 1993). Prospective memory is affected by two types of cues, internal and external. Internal cues involve the internal manipulation of information such as use of mnemonics and retrieval strategies, while external cues involve the manipulation of the environment, such as writing notes and diaries (Harris, 1980) and subjects tend to use more external than internal cues (Meacham & Leiman; 1982). One possible explanation for prospective memory action in the current study is that remembering a belonging should be the most difficult since there are at best non-specific cues (the end of test session) and that the appointment item may be more difficult than delivering a message because it is cued by the task in which it is embedded. Therefore, the PTSD patients, due to concentration and attentional problems, may not be able to utilise the cues (Barba, 1993). However, there are very few studies of these issues with pathological populations and therefore any interpretation should be made with caution.

As previously mentioned recent neuropsychological studies with PTSD have emphasised the role of the hippocampal system to explain memory deficits in PTSD patients (Everly, 1987, 1989; Bremner et al., 1995). They postulate that a smaller right hippocampal volume and possible alterations in symmetry of the hippocampus are associated with memory deficits in PTSD. Two main explanations are as follows:

1- The neurologic hypersensitivity phenomenon (Everly, 1987, 1989): High intensity neural stimulation is postulated to lead to a subsequent hypersensitivity for neurological excitation existing within the limbic circuitry. The hypothesis suggests that there is a heightened sensitivity for excitation in the neural circuits of the limbic system. This hypersensitivity is postulated to cause a wide variety of psychological disturbance.

2- A small right hippocampus from the time of birth may present a premorbid risk factor for the development of PTSD. Extreme stress results in increased release of glucocorticoids, excitatory amino acids, serotonin, and other neurotransmitters and neuropeptides that could be associated with damage to the hippocampus.

The results indicated that the memory performance of PTSD patients were not differentially affected by the type of trauma. Interestingly, boys with PTSD showed poorer prospective memory than girls with PTSD, while total memory performance was the same. Regarding developmental analysis, although a significant difference was found between the two groups (aged under 14 years) on total memory scores, a significant difference was found only on the story immediate recall item. This means that the memory performance of younger patients was differentially affected most by short term verbal memory. This finding is consistent with other studies which found poor short-term verbal memory in adult patients with PTSD (e.g. Bermner et al., 1993) . Adolescents with PTSD revealed a poor performance on more items including prospective items (appointment, belonging, and message delivery), orientation, and to some extent picture recognition, whereas their performance on story recall was the same as controls.

In summary, the cumulative percentage scores of the RBMTshow that the memory of the patient sample is impaired compared to the control group. About 78% of PTSD patients were under performing and fall into the categories labelled poor memory and impaired memory. This is consistent with previous findings about memory in PTSD.

These findings may have some implications for the diagnosis and treatment of PTSD patients. Neuropsychological procedures could be considered as an objective assessment of PTSD and rehabilitation strategies oriented towards compensation for deficits in memory may be useful for PTSD patients. The findings of this study and also other studies suggest that future studies with PTSD should concentrate on specific components of the memory system as well as neuropsychological and neuroanatomical aspects to answer the questions about cognitive functions in PTSD.

CHAPTER 9

GENERAL DISCUSSION

9.1 Introduction

Findings of studies on biases (attention and memory) with different groups of adult subjects with emotional disorders revealed that the biases had an important role in developing a preliminary cognitive model of emotional disorders including PTSD. These findings also helped in presenting a clear view of the nature and inter-relationships of the cognitive functions which appear to be operating in individuals with PTSD.

It was argued that the three models which were most relevant to an empirical research programme with emotionally disordered subjects (namely, Bower, 1981; Beck et al., 1985; and, Williams et al., 1988) all appear to have some theoretical limitations. However, the model of Williams et al. seems more consistent with the status of knowledge at an empirical level and it is more successful in the explanation of different types of emotional disorders. Cognitive theories of PTSD most of which are based on clinical experiences also suffer from some limitations. The Williams et al. model and other cognitive theories of PTSD have led to some research in adults, but there is no research with children with PTSD. The beginning of Chapter 4 noted that there was not a suitable source to develop some cognitive tasks (such as Stroop and memory) using emotional words for young people. Thus, this Chapter described how a "Corpus of Emotional Words Produced by Children and Adolescents" was developed. This resulted in a basic instrument which was used to develop the experimental tasks described in Chapters 5, 6, and 7 to study attentional biases or memory biases in children and adolescents with PTSD.

It was suggested that we are not yet justified in making strong claims about attentional or memory biases in children and adolescents with PTSD. The main aim of these experiments was to find how some paradigms such as Stroop, attentional deployment or recall and recognition tasks operate in children with PTSD or children of adults with PTSD, and the experimental findings are close to which one of theoretical frameworks. Memory deficits in patients with PTSD were studied as information processing which is independent from emotional valence. Such a paradigm was used in a body of research to give a clear explanation of cognitive processing particularly memory deficits in adults with PTSD. Again due to lack of empirical findings related to memory deficits in children and adolescents with PTSD, the main aim of our experiment in Chapter 8 was to investigate how young people with PTSD operate in a standard memory test. However, it is possible to move beyond the paradigmatic level of explanation and begin to make some claims about cognitive processing of young people who suffer from PTSD directly or indirectly. In the current chapter the empirical findings related to attention and memory, and their implications will be discussed.

9.2. Cognitive features of children and adolescents with PTSD

9.2.1. Attentional bias

The favoured explanation of the standard Stroop paradigm is in terms of some kind of competition between generating the name of the ink colour and generating the word at the verbal response stage. So, according to this interpretation there are two explanations of the emotional Stroop effect: (1) activation: which is a function of increased competition at the response stage with trauma-related material due to high "activation" of trauma-related material in long-term memory; (2): inhibition: it is possible that individuals with PTSD symptoms find it harder to "inhibit" the signal to produce the word response if the word is trauma-related. Because colour-naming latency reflects involuntary activation of meaning, interference generated by trauma-related material may provide a quantitative index of intrusive cognitions (McNally, 1995).

The findings of the Stroop task in this thesis indicated that young patients with PTSD exhibit a selective processing bias for trauma related words relative to other types of words and to control subjects. The results of this study support previous findings using the modified Stroop task with adults who suffer from PTSD (e.g. Trandel & McNally, 1987; McNally et al., 1990; McCarthy et al., 1990; Ehlers et al., 1988; Foa et al., 1991; Foa et al., 1991; and Thrasher et al., 1994). Similar patterns of selective processing of threat material in other adult anxious patients have also been reported (e.g. Mathews & MacLeod, 1985; Mogg et al., 1989 and Mathews et al., 1993). These findings are also in line with Martin & Jones' (1992) findings which show that interference on the modified Stroop task with phobia words is higher in children with spider phobia.

The results also suggest that the Stroop interference to trauma-related words is not associated with exposure to a specific trauma. Indeed, the two sub-groups of traumatised subjects (i.e. trauma related to road traffic accident & personal violence) did not differ with respect to their performance on the task. Thus, whereas the Stroop task presented three types of negative words i.e threat, depressed and trauma-related words, both groups of PTSD subjects only exhibited Stroop interference for trauma-related words. Several additional studies support a conclusion that this interference is associated with PTSD itself (Kaspi & McNally, 1991; McNally, English, & Howard, 1993; 1992; Foa et.al., 1991; Thrasher, Dalgleish & Yule, 1994; Martin and Jones, 1992; Kaspi et al., 1995; Vrana et al., in press) as traumatised subjects without PTSD do not show the effects.

Moreover, as noted in Chapter 5 the degree of interference for trauma-related words was significantly related to a self-report measure the IES. There were two positive significant correlations between scores of the IES (particularly Intrusion items of the IES) and RTs to colour-name trauma-related words. A possible explanation for this finding is task irrelevant processing (Williams et al., 1994). According to this explanation, emotional stimuli activate task irrelevant self-preoccupying processes which spend attentional capacity leading to slowing of colour-naming reaction times. In this case, it seems that trauma-related information interferes in cognitive processing of children and adolescents with PTSD because it is relevant to the individual's current situation.

With respect to developmental considerations, children (aged under 13 year old) with PTSD performed the same as controls, but adolescents with PTSD (aged over 13 years) exhibited longer RTs to colour-naming trauma-related words as well as being slower overall relative to controls. In contrast, children of adults with PTSD (aged under 13 years) showed longer RTs towards trauma and threat related material than adolescents of adults with PTSD (aged over 13 years). It seems that differences between the two groups of patients support this idea that young children with PTSD may not be fully aware of the realistic threat of harm to themselves and so may be protected from strong emotional reactions (Yule, 1995) or pay more attention towards external cues of the traumatic event (Pynoos et al., 1995). However, these explanations are speculative and the issue of developmental effects is one to which further studies should probably pay attention (see Chapter 5).

The results of the second experiment also revealed that children of adults with PTSD showed greater interference towards trauma-related and general threat material than other types of words relative to controls. These findings suggest that the cognitive structures of children of traumatised parents may be affected by the parents' PTSD while they did not experience the same trauma. As noted in Chapter 2, studies reported that children may be affected by parental PTSD symptoms and family factors (Green et al., 1991; Schwarz and Perry, 1994; Yule, 1995). According to Yule, where parents had difficulties processing their own emotional reactions, they were less successful in helping their children or there is some evidence that psychological disturbance in PTSD is associated to the preexisting or familial factors (Wolfe & Keane, 1993). However, as Peterson et al. (1991) mentioned, parental response to trauma and to the child's reaction to the traumatic events are important factors in the developing or amelioration of the child's PTSD. So, it seems reasonable that the cognitive functions of children could be affected by the parents' PTSD. As discussed earlier, activation of fear structures (e.g. Foa et al., 1989) by presentation of threatening information (in this case cues of the traumatic event experienced by the parent) could lead to interference with other structures that are required for the integration of information relevant in the Stroop task. In contrast to children with PTSD who showed a selective processing bias only towards trauma-related material, children of adults with PTSD revealed a bias towards both trauma and general threat information. It seems that this is due to a general difficulty in maintaining attentional focus when they are confronted with threat (when they became anxious about their parents' problems) or trauma-related (which caused a problem for their parents) materials.

The results of the study with the attentional deployment task with PTSD patients are in line with the Stroop findings. PTSD patients exhibited a bias in selective attention that favours the pick up of emotionally threatening information particularly social threat material, while they shift attention away from the depressed words. These findings are broadly in agreement with those of MacLeod, Mathews, and Tata (1986) which found that anxious patients tended to shift processing away towards threatening material relative to controls. These findings are also broadly in agreement with those using child subjects with other anxiety disorders and depression (Vasey et al. 1995; Vasey et al., 1994; Taghavi et al., in preparation) which show a clear attentional bias toward emotionally threatening cues in anxious subjects but not in depressed individuals.

According to the content specific hypothesis (Beck, Emery, & Greenberg, 1985) and associative network theory (e.g. Bower, 1980) anxiety is associated with a cognitive bias favouring threat-related information, and this bias should be demonstrated throughought processing activities, including encoding and retrieval. Long term emotional disorders create cognitive fear structures which are activated during emotional arousal (Williams et al., 1988). Individuals with anxiety disorders (such as PTSD) are expected to perceive information relevant to their fears and allocated more resources to the processing of such information. According to Beck, the negative appraisals of anxious subjects tend to be rather specific and are associated more with danger and threat, while depression is associated with schemata concerning negative aspects of the self, the world and the future. The findings of the Stroop tasks with children with PTSD and children of adults with PTSD have demonstrated a selective attentional bias towards trauma-related information which is in line with the emotional disorders frameworks.

In line with this, Foa and Kozak (1986) and Mathews & MacLeod (1985) speculated that the presence of cognitive fear structures or danger schemata, is the most important factor in explaining selective processing. As discussed in Chapter 3, these structures are the patterns of interpretation of information which are stored in memory and are thought to facilitate the integration of new information about one's experiential world. Thus, when pathological structures are activated, they seem to interfere with the accessing of other structures that are required for integration of information relevant to competing tasks. This explanation predicts that any information associated with the traumatic event will produce Stroop or probe dot interference.

Rachman (1980) argued that "emotional processing" is based on three conditions: (a) presence of an emotional disturbance; (b) the disturbance has to decline; and (c) a return to the normal situation or to routine behaviour. If an emotional disturbance occurs, while the two other conditions (declining disturbance, and a return of routine behaviour) do not occur, then the emotional processing will be incomplete. Persistence or return of intrusive phenomena such as nightmares indicates incomplete emotional processing. Rachman argued that indirect signs of PTSD may include an inability to concentrate on the task, so leading to excessive restlessness and irritability. Therefore, the presence of biases towards trauma-related information in children and adolescents with PTSD could be interpreted as a result of intrusive signs of emotional activity due to the exposure of the individual to trauma-related material.

It seems that the findings of the current study are also in line a number of cognitive models of PTSD (e.g. Foa's fear network theory, 1989; the cognitive processing theory of Creamer et al., 1992; Brewin et al.'s dual representation theory, in press). All of these cognitive theories of PTSD share certain core theoretical assumptions. They suggest that individuals with PTSD bring a set of pre-existing experiences to the traumatic event. These two sets of information are incompatible with each other, and the attempt to assimilate the traumatic information which is activated by traumatic reminders leads to an interference on cognitive tasks such as the Stroop or attentional deployment. It seems reasonable, therefore, to assume that, initially at least, there may be some mileage in applying these adultocentric theories to children with PTSD.

9.2.2. Memory bias

Although the results showed clear evidence of processing biases in both attention-based paradigms (Stroop and attentional deployment tasks) with PTSD patients and children of adults with PTSD towards trauma-related material in the Stroop and threat material in the probe dot, there was no evidence of any bias for such material in recall and recognition memory tests in both groups of subjects.

The findings of the recall and recognition tests support the hypothesis that PTSD patients do not show a significant explicit memory bias toward negative words, particularly trauma-related cues, relative to controls. In line with this, Zeitlin & McNally (1991) found no significant explicit memory bias in adults who suffer from PTSD. Children with PTSD also tended to show poor overall memory performance which is consistent with the clinical features of poor memory in PTSD patients (see below).

From a theoretical perspective, it seems that the current findings about recall and recognition memory bias do not support content specific hypothesis of Beck (e.g., 1985). According to Beck, anxiety is associated with future threat, while depression is characterised by negative thoughts which are concerned with the past experience. Beck states that:

".....a person is prepared to focus on important aspects of a situation and apply the appropriate "formulas" to their analysis. This advance preparation involves the activation of "cognitive structures" (schemas) that orient the individual to a situation and help him to select relevant details from the environment and to recall relevant data." (p. 54, 1985)

Although children with PTSD overall recalled fewer words than controls, but they retrieved trauma-related words the same as controls. Therefore, the findings of the current thesis about memory bias is inconsistent with Beck's model.

In Bower's (e.g. 1980) affect congruent effect theory, when a person is in an emotional state (e.g. PTSD) the node related to that emotion is activated and activation spreads to associated nodes which contain information which is congruent in mood with the experienced emotion. In the case of PTSD, trauma-related information would become activated due to traumatic network memory. Bower predicts that all tasks involving access to stored information should demonstrate mood-congruent effects due to increased activation of mood-congruent information. Thus, there should be mood-state dependent recall. So, according to this explanation PTSD patients should recall more trauma-related words than controls, but the findings are inconsistent with this hypothesis.

Cognitive theories of PTSD (e.g. Foa et al., 1989; Brewin et al. in press) predict that the memory network comprises certain types of information, including details of the context in which trauma-related stimuli are present. When a trauma-related stimulus is presented, the network memory becomes biased towards trauma-related cues. The results of the recall and recognition tests with young people with PTSD suggest that the activation of network memory in PTSD does not occur in retrieval form. So these theories failed to explain recall and recognition performance on children with PTSD.

However, these data are in line with the Williams et al. (1988) model. In this model the distinction between automatic and strategic processing is central. Anxiety disorders, including PTSD, operate mainly on automatic processing, while depression operates on strategic processes. Because memory is more strategic, and attention is automatic, this is the reason why anxiety tends to show a selective attentional bias and the effect of depression is more strong on memory. Thus, the findings of recall and recognition tests are more fitted with Williams et al.'s model.

In conclusion, the findings of these studies i.e attention and memory with children and adolescents with PTSD which have been carried out for the first time revealed a similar pattern of cognitive biases as adults. These data suggest that children with PTSD and children of adults with PTSD are characterised by a specific cognitive bias favouring trauma-related words and threat words (in the absence of trauma-related words) at the attentional level, but no such bias at the mnemonic level.

9.2.3. Comparison with anxious and depressed children's findings

Two other sets of studies were carried out with the same ~~od~~ attention and memory task but using anxious and depressed children (aged 9-17 years old). In this section I attempt to compare these findings and present a brief discussion about information processing in children and adolescents with emotional disorders.

The results of the Stroop task with anxious and depressed children indicated that anxious children exhibited a selective attentional bias towards threatening information relative to control subjects and other types of words i.e. depression-related, happy, trauma-related, and neutral words (Taghavi et al., 1996) which is line with the findings of children and adolescents with PTSD. While depressed patients revealed no such selective processing bias towards depression-related or other types of words (Neshat-Doost, 1996).

Regarding the attentional deployment paradigm, the findings provided evidence for the existence of an attentional bias towards general threat stimuli in the absence of trauma-related words in children who suffer from PTSD. When confronted with a threat cue, PTSD patients responded to subsequent probes more quickly than when exposed to depression-related cues. On the other hand, control subjects exhibited equal response latencies for probes following both threat and depression-related material. Findings with anxious children revealed that anxious children, but not normal controls, consistently deploy attention towards both types of threat-related (physical threat & social threat) stimuli but not to depression-related stimuli (Taghavi, 1996). Interestingly, the results of the probe dot task with depressed and mixed depressed (patients who were highly depressed and anxious) children showed that both clinical groups did not exhibit a selective processing bias towards depressed or threat material but that they shift their attention away from all negative words in the same way as controls. One possible explanation for this differences between depression and anxiety disorders including PTSD suggested that anxiety is characterised by attentional biases operating at a perceptual stage or early stage of processing to facilitate the pickup of mood congruent, emotionally threatening materials, while depression is characterised by biases operating at the retrieval level or late stage processing which facilitate the recall of mood-congruent, emotionally negative information (MacLeod et al., 1986; Mathews, 1993). Such a distinction between cognitive processing of emotional disorders could lead to make a clear clinical distinction between depression and anxiety. For example, depressed patients generally attribute their negative affect to internal sources, while anxious subjects particularly PTSD patients tend to attribute their affect to external sources which sometimes leads to avoidance from certain kind of situation.

Regarding memory bias, the findings of the recall and recognition tests indicated that anxious children showed no explicit recall memory bias, but they exhibited an explicit recognition memory bias, such that anxious subjects recognised more threat words than controls (Taghavi, 1996). PTSD children revealed neither recall nor recognition memory bias towards any types of emotional words relative to controls. Depressed patients did not show any memory bias in recall or recognition tests when they were confronted with general negative words, but they exhibited a selective memory bias in both recall and recognition tests when the presented words were self-descriptive adjectives (Neshat-Doost, 1996). It seems that the findings of these studies are relatively in line with those with adults with emotional disorders (e.g., Mathews et al., 1989; Richards & Whittaker, 1990).

Although cognitive theories such as Bower (e.g. 1980) fail to explain all these findings in the same framework, the current findings fit better with Williams et al model (1988). As noted above, depression is more associated with the bias in the late stage of processing or strategic aspect of encoding, therefore, depressed patients attributed their negative mood to the themselves. The question is raised as to why the negative bias is only associated with the recall of personally relevant information in depression? It seems that depressed subjects tend to recall negative material that has been encoded in relation to themselves, as the material concerned is relevant to the current situation of the individual. According to Beck (1976, 1987) depressed individuals have cognitive biases about self, world, and future. Beck defined these cognitive biases (even the biases about world and future) in a self-referent way. Results of studies by Butler and Mathews (1983) are also consistent with the hypothesis that the cognitive biases of depressed individuals are self-relevant.

Therefore, the theoretical hypotheses of Bower (e.g., 1981), and Beck and Emery (1985) successfully predict that anxious and PTSD patients should exhibit an attentional bias towards negative-related words and a memory bias towards depressed content in depression. However, both of them failed to provide a satisfactory account of attention in depression and an explicit memory bias in anxiety and PTSD patients.

In contrast, Williams et al. (1988) suggested that anxiety disorders including PTSD are associated with biases in attention and not memory bias, favouring emotionally threat-related materials, while depression which is associated with a negative self-related bias in recall is not associated with an attentional bias. As noted earlier Williams et al. (1988) proposed that depressed subjects could elaborate negative information such as is shown on recall and recognition tests. They define 'elaboration' as 'the activation of a representation in relation to other associated representations to form new relationships between them and to activate old relationships' (p. 170). They suggested that such elaboration is inhibited in anxiety including PTSD and that the presence of attentional biases in anxious subjects may reflect automatic priming or integration processes (see Chapters 3 and 7). The correspondence between the present data and the Williams et al. (1988) model suggests that, initially at least, there may be some benefit in applying the Williams et al. framework to children with emotional disorders, including PTSD. The similar pattern of findings in children with PTSD and children of adults with PTSD further suggest that information processing approaches such as that of Williams et al. may have a range of application broader than that of the individuals actually experiencing symptoms of emotional disorder.

9.2.4. Implications for processes underlying treatment

Foa and Kozak (1986) suggested that a successful treatment of individuals with anxiety disorders modifies their cognitive fear structures. So, the selective processing of threat-related information will be decreased following successful treatment of the disorders. For example, Watts (1986) showed that attentional bias with the Stroop paradigm in spider phobics reduced after a course of behavioural therapy. In this line, Foa and McNally (1986) also found that the attentional bias on a dichotic listening task diminished in contamination anxiety. These findings suggest that anxiety is the cause of the attentional bias towards threat information. In respect to the treatment of emotional disorders Williams et al.'s state that:

"....if the affective disturbances associated with exposure to a stimulus can be reduced, in terms of our model this will reduce the output of the affective decision mechanisms. At the preattentive stage this will reduce attentional deployment towards the source of threat for anxious patients. At the elaboration stage this will reduce the spread to associated negative concepts for depressed patients" (p. 181, 1988).

In the case of PTSD, it seems that the traumatic events cause specific attentional bias which should reduce after systematic treatment. Therefore, pre and post-treatment information processing performance may provide valuable information to see the cognitive changes underlying different intervention approaches. At the present, self-report measures such as Impact of Event Scale are the standard means of comparing outcome across different treatment approaches of PTSD. These measures suffer from problems of interpretation such as response bias. Information processing methods such as Stroop effect are sensitive to changes of symptoms of PTSD and can be used not only as outcome measure, but for assessing the fear and intrusive thoughts that are not elicited by self-report measures.

Foa et al. (1989) proposed that reduction of fear can occur via two conditions: (a) the fear memory must be activated through any of the three network elements: information about the stimuli, responses, or meaning, and (b) new information must be provided that is incompatible with the current fear structure in order for a new memory to be formed. They suggested that systematic exposure to the traumatic memory in a safe environment serves to modify the feared memory such that threat-related cues are reevaluated and habituated. Resick and Schnicke (1992) suggest a cognitive processing therapy of PTSD based on information-emotional processing theory of PTSD. This method includes education, exposure, and cognitive components. Their experimental study showed that this method was effective in improving symptoms of PTSD patients.

However, it seems that cognitive therapy for PTSD provides means for activating the memory structure. The cognitive activation would include conflicting beliefs and meanings attributed to the event and expectations regarding the future that might not be elicited by other forms of exposure therapy. Therefore, it may be suitable to develop a therapy that will activate the memories of the event and will also provide corrective information regarding conflicts attributions that interfere with complete processing. The symptoms of PTSD such as intrusion, avoidance, and arousal are usually caused by conflicts between the new information and prior structure which my be concerned with danger and safety. Following traumatic events, PTSD individuals have overwhelming emotions that they attempt to suppress or avoid. The exposure component of traumatic events via processing of trauma-related information can elicit all of the emotions and their related beliefs. So, the findings of the current thesis may lead to a useful cognitive therapy which treats PTSD with exposure of trauma-related cues to reduce the symptoms particularly those related to the intrusive thoughts in young people with PTSD.

Another implication of the current thesis' findings suggest that the use of information processing tasks such as Stroop or neuropsychological memory test can serve as valuable methods for differentiating PTSD patients from other groups of patients such as anxiety disorders or those disorders which have comorbidity with PTSD. It seems that attentional tasks (Stroop and attentional deployment tasks) could serve as useful instruments for differentiating of PTSD following different types of trauma. For example, survivors of ship disaster should show a selective processing bias towards material related to the disaster, while assaults victims will show longer reaction times towards information related to the assaults.

9.2.5. Memory deficits in children with PTSD

As discussed in Chapter 8 PTSD patients showed a general poor memory in RBMT on total score and on items such as story recall, prospective items or orientation. These findings are supported by the clinical features of PTSD which include poor memory and poor concentration (Yule, 1992) leading to poor performance in academic work (Yule, 1995). Although PTSD patients revealed a general poor memory relative to controls, they performed in most items of the RBMT the same as controls (except prospective items, story recall and orientation). All items of RBMT were carried out in the explicit form. The distinction between implicit and explicit memory was proposed by Graf and Schater (1985). Generally, implicit memory is facilitated by integrative processing, whereas elaborative processing plays an important role in facilitating retrieval from explicit memory. Implicit memory is investigated by instructions which do not reveal the fact that memory is being assessed, while explicit memory is investigated by providing clear instruction that perviously learned material is to be retrieved.

Although children and adolescents with PTSD did not show an explicit memory bias towards trauma-related material but they exhibited a general poor explicit memory in the RBMT. Similar pattern of explicit memory impairment was found in amnesic patients (Schater & Graf, 1986; Schater, 1987). Yehuda et al. (1995) suggested that memory dysfunction in PTSD may involve the intermingling of past experiences with current experiences in the form of intrusive thoughts or flashbacks leading to a specific deficits in the monitoring and regulation of memory infirmation. So the presence of substantial memory deficits and forgetting provide an interesting contrast with the phenomenology of intrusive recollections in PTSD which may be compatible with ideas relating to psychogenic amnesia.

Neuropsychological explanations suggests that modification in the hippocampus and possibly other brain structures involved in memory , such as the amygdala, prefrontal cortex, and temporal lobe, may cause deficits in memory functions (see Chapter 8).

The findings of RBMT also showed that prospective memory of PTSD patients is more vulnerable than retrospective memory. Regarding prospective memory, Craik (1986) suggests that remembering should be considered as an interaction between environmental and organismic factors. When environmental support such as cues and context is weak, as in free recall, successful remembering relies more on the self-initiated activities of the rememberer which are voluntary and effortful. Therefore, the less contextual support and the high level of self-initiated activities required, the more vulnerable a task will be to impairment. According to Craik (1986) prospective memory tasks are more vulnerable to impair than retrospective memory tasks. In respect of prospective memory deficit in PTSD patients, it is possible to attribute this difference to the following factors: (a) PTSD patients are hyperalert particularly to the environmental cues leading to weak contextual support, (b) according to Levy and Loftus (1984) prospective memory tasks involve a number of different cognitive operations including generating a cue to carry out the action at the time; remembering what the action is, and finally carrying it. So these may impair performance on the prospective memory tasks more than other types of memory tasks. Further analysis showed that, although the total memory scores were the same for boys and girls with PTSD, boys exhibited poorer prospective memory relative to girls. This finding revealed that boys have more problems than girls in remembering those actions which are related to the future.

Younger patients with PTSD (aged under 14 years old) showed an impairment only on the story immediate recall sub-test, while they performed the same as controls in other sub-tests. Adolescents with PTSD (aged over 14 years) revealed a poorer performance on more items including prospective items (appointment, belonging, and message delivery), orientation, and, to some extent on picture recognition, whereas they performed the same as controls on the story recall. This means that the memory deficits in adolescents with PTSD are more complicated than those in younger children.

Further studies using various neuropsychological tests with children and adolescents with PTSD should be performed to support the possibility that the effects observed are specific to PTSD. The current findings suggest that using some neuropsychological memory instruments represent an objective assessment of memory functions in children with

PTSD. Pre and post-treatment memory performance using neuropsychological standard tests may represent useful information to see the memory changes underlying different intervention approaches. This procedure may also be considered as a useful device in rehabilitation strategies oriented towards compensation for deficits in memory. The present findings also suggest that future studies with young people with PTSD should focus on highly specific components of the memory system.

9.3. Future line of research

On a wider front, there are clearly numerous questions which remain unanswered. Issues such as the relationship between PTSD and anxiety disorders; between PTSD and dissociative disorders; the relationship between cognitive biases and cognitive symptoms of PTSD such as intrusive thoughts or flashbacks, developmental effects on cognitive functions of PTSD, the effects of treatment on the cognitive processing biases, the relationship between PTSD and neurological disturbances and so on. For example, although PTSD can be classified as a sub-group of anxiety disorders, there are some differences between PTSD and anxiety on cognitive functions such as memory impairment and poor concentration. It seems that further studies may make a clearer distinction between the two types of disorder.

Progress in answering these questions is extremely important if any kind of broad picture of the nature of the cognitive functions (i.e. attentional bias, memory bias or memory deficits) associated with young people with PTSD is to emerge. The emotional Stroop and recall and recognition tasks were the only paradigms which compared children with PTSD and children of adults with PTSD with matched controls. The results showed a significant Stroop effect with trauma-related material in both groups but no such effect was found in recall and recognition paradigm. It was suggested that this might reflect the greater amount of automatic processing or integration of trauma-related material in long-term memory in PTSD patients. However, it would clearly have been desirable to have both children with PTSD and children of adults with PTSD groups in all of the experiments reported in this thesis to provide a broader ranging investigation of this hypothesis.

It seems sensible to present the tasks to different groups of traumatised children and adolescents in order to see if the bias found with the young people who were involved in the RTA or PV accidents is found in other types of PTSD patients. In Chapter Six we used an attentional deployment task with threat and depression-related material and not with trauma-related stimuli. It would be interesting to present this task with a corpus of trauma-related material to different groups with PTSD to see if the bias found will be shown by the subjects.

9.4. Summary

A useful source of emotional words (for children and adolescents) was developed to permit better selection of words for use in studies of emotional information processing in children and adolescents. It is hoped that this should be a useful source to develop cognitive tasks using words with emotional valence. Three different computerised cognitive paradigms (namely, Stroop, probe dot, and recall and recognition) that have been used with adult patients with emotional disorders were successfully developed for use with children and adolescents with PTSD and children of adults with PTSD. All these tasks were used for the first time to study cognitive information processing in young people who were involved directly or indirectly with a traumatic event. These paradigms provide a new set of techniques that can be useful to investigate developmental aspects of cognitive processing of emotional valence in young people. As mentioned in each experimental chapter and the current chapter, developmental considerations of the data illustrated some differences between the two groups of patients in the processing of emotional information. The findings of Chapter 8 illustrated that patients with PTSD suffer from poor memory which has major implication for clinicians and investigators who deal with this disorder.

REFERENCES

Agras, W.S., & Wilson G.T. (1995). Learning Theory. In H. Kaplan, & B. Sadock (Eds), *Comprehensive Text Book of Psychiatry VI,* Baltimore: Williams & Wilkins.

Allen, S.N., (1994). Psychological assessment of post-traumatic stress disorder: psychometrics, current trends, and future directions. *The Psychiatric Clinics of North America,* 17, 327-350.

American Psychiatric Association (1968). *Diagnostic and Statistical Manual of Mental Disorders*, 2nd edition *(DSM-II)*. American Psychiatric Association Washington DC.

American Psychiatric Association (1980). *Diagnostic and Statistical Manual of Mental Disorders*, 3rd edition *(DSM-III)*. American Psychiatric Association: Washington DC.

American Psychiatric Association (1987). *Diagnostic and Statistical Manual of Mental Disorders,* 3rd edition, revised *(DSM-III-R)*. American Psychiatric Association: Washington DC.

American Psychiatric Association (1994). *Diagnostic and Statistical Manual of Mental Disorders*, 4th edition, *(DSM-IV)*. American Psychiatric Association: Washington DC.

Asmundson, G.J.A., Sandler, L.S., Wilson, K.G., & Walker, J.R. (1992). Selective attention toward physical threat in patients with panic disorder. *Journal of Anxiety Disorders, 6*, 295-303.

Anderson, J. & Bower, G.H. (1973). *Human associative memory.* Washington, D.C.: Winston.

Averill, J. R. (1975). *A Semantic Atlas of Emotional Concepts. (JSAS catalogue of selected documents in psychology).* University of Massachusetts, Amherst.

Baddeley, A. (1966). Short-term memory for word sequences as a function of acoustic, semantic and formal similarity. *Quarterly Journal of Experimental Psychology,* 18, 362-365.

Baddeley, A. (1990). *Human Memory*: Theory and Practice. Boston: LEA Associates Ltd.

Baddeley, A. (1982). Reading and working memory. *Bulletin of the British Psychological Society, 35*, 414-417.

Baddeley, A. (1994). Working memory: Interface between memory and cognition. In D. L. Schacter, & E. Tulving (Eds.), *Memory Systems*, Boston, M A: Massachusetts Institute of Technology.

Baddeley, A. (1995). The Psychology of Memory. In A. Baddeley, B. Wilson, & F. Watts (Eds). *Handbook of Memory Disorders,* Chichester John Wiley & Sons Ltd.

Blanchard, E.B., Kolb L.C., & Prins, A. (1991). Psychophysiological responses in the diagnosis of posttraumatic stress disorder in Vietnam veterans. *Journal of Nervous Mental Diseases,* 179, 97-101.

Barba, G.D. (1993). Prospective memory: A 'new' memory system?. In F. Boller, & J. Grafman (Eds). *Handbook of Neuropsychology*, vol. 8, Amsterdam: Elsevier Science Publishers. 239-251.

Bargh, J.A. & Tota, M.E. (1988). Context-dependent automatic processing in depression: Accessibility of negative constructs with regard to self but not others, *Journal of*

Personality and Social Psychology, 54, 925-939.

Bartlett, F. C. (1932). *Remembering: A Study in Experimental and Social Pychology.* Cambridg: Cambridge University Press.

Beck, A.T., Rush, A.J., Shaw, B.F., & Emery G. (1979). *Cognitive Therapy of Depression.* New York: Guilford Press.

Beck, A.T. & Steer, R.A. (1987). *Beck Depression Inventory Manual.* San Antonio:The Psychological Corporation Harcourt Brace Jovanovich.

Beck, A.T. & Clark, D.A. (1988). Anxiety and depression: An information processing perspective. *Anxiety Research, 1,* 520, 23-6.

Beck, A.T. (1976). *Cognitive therapy of the emotional disorders.* New York: New American Library.

Beck, A.T., Emery, G., & Greenberg, L. (1985). *Anxiety Disorders and Phobias: A Cognitive Perspective.* New York: Basic Books.

Becker, J.V., Skinner, L.J., Abel, G.G., Axelrod, R., & Cichon, J. (1984). Sexual problems of sexual assault survivors. *Women & Health,* 9, 5-20.

Bellew, M. & Hill, A.B. (1990). Negative recall bias as a predictor of susceptibility to induced depressive mood. *Personality and Individual Differences,* 11, 471-480.

Bental, R.P. & Keney, S. (1989). Content specific information processing and persecutory delusions: An investigation using the emotional Stroop test. *British Journal of Medical Psychology, 62,* 355-364.

Birleson, P. (1981). The validity of depressive disorder in childhood and the development of a self-rating scale: A research report. *Journal of Child Psychology Psychiatry, 22*, 73-88.

Birleson, P., Hudson, I., Buchanan, D., & Wolff, S. (1987). Clinical evaluation of a self-rating scale for depressive disorder in children (Depression Self-Rating Scale). *Journal of Child Psychology & Psychiatry, 28*, 43-60.

Blake, D.D., Weathers, F.W., & Nagy L.M. (1990). A clinical rating scale for assessing current and lifetime PTSD: The CAPS-1. *Behaviour Therapy.* 13, 187-188.

Blanchard, E.B., Kolb L.C., & Prins A. (1991). Changes in plasma norepinephrine to combat stimuli in Vietnam veterans with posttraumatic stress disorder. *Journal of Nervous and Mental Diseases,* 179, 371-373.

Blank, A.S., (1994), Clinical detection, diagnosis and differential diagnosis of Post-traumatic stress disorder. *The Psychiatric Clinics of North America,* 17, 351-384.

Bower, G. H. (1981). Mood and memory. *American Psychologist.* 36, 129-148.

Bower, G.H. (1987). Commentary on mood and memory. *Behaviour Research and Therapy.* 25, 443-455.

Bower, G.H. & Cohen, P.R. (1982). In M.S., Clark & S.T., Fiske, (eds). *Affect and Cognition.* London: Lowrence Erlbaum Associations.

Bower, G.H., Monteiro, K.P., & Gilligan, S.G. (1978). Emotional mood as a context for learning and recall. *Journal of Verbal Learning and Verbal Behavior.* 17, 573-585.

Bradley, B.P. & Mathews, A. (1983). Memory bias in recovered clinical depressive. *Cognition and Emotion.* 2, 235-245.

Bradley, B., Mogg, K., Galbraith, M., & Perrett, A. (1992). Negative recall bias and neuroticism: State vs trait effects. *Behaviour, Research & Therapy,* 31, 125-127.

Bradley, B. & Mogg, K. (1994). Mood and personality in recall of positive and negative information. *Behaviour, Research & Therapy,* 32, 137-141.

Bradley, P.B., Mogg, K., & Williams, R. (1994). Implicit and explicit memory for emotion-congruent information in clinical depression and anxiety. *Behaviour, Research & Therapy,* 33, 755-770.

Bradley, P.B., Mogg, K., & Williams, R. (1994). Implicit and explicit memory for emotional information in non-clinical subjects. *Behaviour, Research & Therapy,* 32, 65-78.

Bradley, B.P. & Mathews, A. (1988). Memory bias in recovered clinical depressives. *Cognition and Emotion,* 2, 235-245.

Braun B.G. (1993), Multiple Personality Disorder and Postraumatic Stress Disorder: Similarities and differences; In J.P. Wilson & B. Raphael (Eds), *International Handbook of Traumatic Stress Syndromes,* Plenum Press, New York.

Bremner, J.D., Krystal, J.H., Southwick, S.M., & Charney, D.S. (1995). Functional neuroanatomical correlates of the effects of stress on memory. *Journal of Traumatic Stress,* 8, 527-553.

Bremner, J.D., Randall, P., Scott, T.M., Bronen, R.A., Seibyl, J.P., Southwick, S.M., Delaney, R.C., McCarthy, G., Charney, D.S., & Innis, R.B. (1995). MRI- based measurement of hippocampal volume in combat-related posttraumatic stress disorder. *American Journal of Psychiatry,* 152, 973-981.

Bremner, J.D., Scott, T.M., Delaney, R.C., Southwick, S.M., Mason, J.W., Johnson, D.R., Innis, R.B., McCarthy, G., & Charney, D.S. (1993). Deficits in short-term memory in Posttraumatic Stress Disorder. *American Journal of Psychiatry,* 150, 1015-1019.

Brett, E.A. (1993). Classification of Posttraumatic Stress Disorder in DSM-IV: Anxiety disorder, dissociative disorder, or stress disorder? In J.R. Davidson & E.B. Foa (Eds), *Posttraumatic Stress Disorder: DSM-IV and Beyond.* Washington DC. London.

Broadbent, D.E., & Broadbent, M. (1988). Anxiety and attentional bias: State and trait. *Cognition and Emotion,* 2, 165-183.

Brewin, C.R., Dalgleish, T. & Joseph, S. (In press). A dual representation theory of post-traumatic stress disorder. *Psychological Review.*

Burgess, A, W., & Holstromm, L. L. (1974). Rape trauma syndrome. *American Journal of Psychiatry,* 131, 981-986.

Burgess, I.S., Jones, L.M., Robertson, S.A., Radcliffe, W.N., & Emerson E. (1981). The degree of control exerted by phobic and non-phobic verbal stimuli over the recognition behaviour of phobic and non-phobic subjects. *Behaviour Research and Therapy, 19,* 233-243.

Burke, L.D., Moccia, P., Borus, J.F., & Burns, B.J. (1986). Emotional distress in fifth-grade children ten months after a natural disaster. *Journal of the American Accademy of Child Psychiatry,* 25, 536-541.

Burke, M. & Mathews, A. (1992). Autobiographical memory and clinical anxiety. *Cognition and Emotion,* 6, 23-35.

Butler, G. & Mathews, A. (1983). Cognitive processing in anxiety. *Advances in Behavioural Research & Therapy, 5*, 51-62.

Butler, G. & Mathews, A. (1987). Anticipatory anxiety and risk perception. *Cognitive Therapy & Research, 11, 551-565.*

Butters, N., Heindel, W. C., & Salmon, D. P. (1990). Dissociation of implicit memory in dementia: Neuropsychological implications. *Bulletin of the Psychonomic Society,* 28.

Carter, C.S., Maddock, R.J., & Magliozzi, J. (1992). Patterns of abnormal processing of emotional information in panic disorder and major depression. *Psychopathology, 25*, 65-70.

Cassiday, K.I., McNally, R.J., & Zeitlin, S.B. (1992) Cognitive processing of trauma cues in rape victims with Post-Traumatic Stress Disorder. *Cognitive Therapy & Research, 16*, 283-295.

Cattell, J.M. (1886). The time it takes to see and name objects. *Mind,* 11, 63-65.

Charney D.S., Deutch A.Y., Krystal J.H., & Southwick S.M., (1993). Psychobiology mechanisms of Post-Traumatic Stress Disorder, *Archives General Psychiatry,* 50, 294-305.

Chemtob, C., Roitblat, H.L., Hamada, R.S., Carlson, J.G., & Twentyman, C.T. (1988). A cognitive action theory of posttraumatic stress disorder. *Journal of Anxiety Disorders, 2,* 253-275.

CocKburn J.,Wilson B., Baddeley A. & Hiorns R. (1990), Assessing every day memory in patients with dysphasia. *British Journal of Clinical Psychology,* 29, 353 - 360.

Cohen R.M., Weingartner H., Smallberg S.A., Pickar D. & Murphy D.L. (1982). Effort and cognition in depression. *Archives of General Psychiatry,* 39, 593-597.

Cohen, N. J. (1984). Preserved learning capacity in amnesia: Evidence for multiple memory systems. In L. R. Squire & N. Butters (Eds.), *Neuropsychology of Memory.* New York: Guilford Press.

Cohen, N. J., & Squire, L. R. (1980). Preserved learning and retention of pattern analyzing skill in amnesia. Dissociation of knowing how and knowing that. *Science,* 210, 207-209.

Craik, F.I.M. (1986). A functional account of age differences in memory. In Klix, F., & Hagendord, H. (Eds). *Human memory and cognitive capabilities: mechanisms and performances.* Elsevier Science publishers, Amsterdam, 409-422.

Delaney RC, Rosen AJ, Mattson RH, Novelly RA (1980). Memory function in focal epilepsy: A comparison of non-surgical, unilateral temporal lobe and frontal lobe samples. *Cortex,* 16, 103-117.

Denny, E.B. & Hunt, R.R. (1992). Affective valence and memory in depression: Dissociation of recall and fragment completion. *Journal of Abnormal Psychology,* 101, 575-580.

Cooper, B. (1986). Mental disorder as reaction: The history of a psychiatric concept. In H. Katschnig (Ed.), Life Events and Psychiatric Disorders: Controversial Issues, Cambridge: Cambridge University Press.

Creamer, M., Burgess, P., & Pattison, P. (1992). Reaction to trauma: A cognitive processing model. *Journal of Abnormal Psychology,* 101, 452-459.

Dagleish, T. & Watts, F.N. (1990). Biases of attention and memory in disorders of anxiety and depression. *Clinical Psychology Review, 10*, 589-604.

Dalgleish, T. (1991). *The Processing Of Emotional Information In Sub-Clinical And Clinical Anxiety States*, Unpublished PhD thesis, Institute of Psychiatry, University of London.

Dalgleish, T. (1993). *The Judgement of Risk in Traumatised and Non-Traumatised Disaster Survivors.* Unpublished Masters thesis, University of London, London, U.K.

Dalgleish, T. (1994). The relationship between anxiety and memory biases for material that has been selectively processed in a prior task. *Behaviour, Research and Therapy*, 32, 227-231.

Dalgleish, T. (1995). Performance on the emotional Stroop task in groups of anxious, expert and control subjects: A comparison of computer and card presentation formats. *Cognition & Emotion.*

Dalgleish, T. (1995). Theoretical Approaches to Post-traumatic Stress Disorder: The SPAARS model. Paper presented at the *Third European Conference on Traumatic Stress,* Paris, France, May 1995.

Dalgleish, T. (In press). Cognitive Theories of Posttraumatic Stress Disorder. In W. Yule (Ed.), Post-Traumatic Stress Disorders. Chichester: Wiley.

Dalgleish, T. (In press). The appraisal of threat and the process of selective attention in clinical and sub-clinical anxiety states II: Evidence. *Clinical Psychology and Psychotherapy.*

Davidson, L.M., & Baum A. (1986). Chronic stress and post-traumatic stress disorder, *Journal of Consulting Clinical Psychology,* 54, 303-308.

Davidson J.R.T., Schwartz M. & Storck M. (1985). A diagnostic and family study of post-traumatic stress disorder. *American Journal of Psychiatry,* 142, 90-93.

Davidson, J.R.T., Hughes, D., & Blazer D. (1991). Post-traumatic stress disorder in the community: An epidemiological study. *Psychological Medicine,* 21, 1-9.

Davidson J.R.T. (1995), Posttraumatic Stress Disorder and Acute Stress Disorder. In H. Kaplan, & B. Sadock (Eds), *Comprehensive Text Book of Psychiatry VI,* Baltimore: Williams & Wilkins.

Davidson L.M., & Baum A. (1994), Psychophysiological aspects of chronic stress following trauma. In R.J. Ursano, B.G. McCaughey, & C.S. Fhllerlon, *Individual and community responses to trauma and disaster.* Cambridge: Camberidge University Press.

Davidson J.R.T, Schwartz M., & Storck M., (1985). A diagnostic and family study of posttraumatic stress disorder. *American Journal of Psychiatry* 142: 90-93.

Davidson J.R.T., Smith R., & Kudler H. (1989). Familial psychiatric illness in chronic posttraumatic stress diaorder. *Comparative Psychiatry* 30, 1-7.

Davidson & E.B. Foa (1994), *Posttraumatic stress disorder: DSM-IV and Beyond.*Washington, D.C: American Psychiatric Press, Inc.

Davis, M. (1992). The Role of Amygdala in fear and anxiety. *Annual Review. Neurosc.* 15: 353-357.

Dawkins, K., & Furnham, A. (1989). The colour naming of emotional word. *British Journal of Psychology, 80,* 383-389.

DiBenedetto A.M. & Evans I. (1989, November). *Selective processing in obsessive* *compulsive disorder as measured by a Stroop colour word task.* Poster presented at the 23rd annual convention of the Association for the Advancement of Behaviour Therapy, Washington D.C.

Dunn, L.M. (1959). *Peabody Picture Vocabulary Test Manual.* Circle Pines, MN: American Guidance Service.

Dunn, L.M. & Dunn, L.M. (1981). *Peabody Picture Vocabulary Test-Revised Manual.* Circle Pines, MN: American Guidance Service.

Dunn, L.M., Dunn, L.M., Whetton, C., & Pintilie, D. (1982). *The British Picture Vocabulary Scale: Manual for the Short and Long Forms.* Great Britain: The Cromwell Press.

Eichenbaum, H. (1992). The hippocampal system and declarative memory in animals. *Journal of Cognitive Neuroscience,* 4, 217-231.

Ehlers, A., Margraf, J., Davies, S., & Roth, W.T. (1988). Selective processing of threat cues in subjects with panic attacks. *Cognition & Emotion, 2*, 201-209.

Elliott, C.L. & Greene, R.L. (1992). Clinical depression and implicit memory. *Journal of Abnormal Psychology.,* 101, 572-574.

Everly, G.S., & Horton, A.M. (1989). Neuropsychology of Posttraumatic Stress Disorder: A pilot study. *Perceptual and Motor Skills,* 68, 807-810.

Eysenck, M.W. (1992). *Anxiety: The Cognitive Perspective.* London: Lawrence Erlbaum.

Eysenck, M.W. & Mogg, K. (1993). Clinical anxiety, trait anxiety, and memory bias. In J. Christiansen (Ed.), *The Handbook of Emotion and Memory: Research and Theory.* New Jersey: LEA.

Eysenck, M.W., & Burne, A. (1994). Implicit memory bias, explicit memory bias, and anxiety. *Cognition and Emotion,* 8, 415-431.

Eysenck, M.W., MacLeod, C., & Mathews, A. (1987). Cognitive functioning and anxiety. *Psychological Research, 49*, 198-195.

Eysenck, M.W. & Keane, M.T. (1990). *Cognitive psychology: A Student's Handbook.* London: Lawrence Erlbaum Associates Ltd.

Finch, A.J., & Daugherty, T.K. (1993). Issues in the assessment of posttraumatic stress disorder in children. In C. F. Saylor (Ed.), *Children and Disasters*. New York: Plenum Press.

Foa, E.B. & McNally R.J. (1986). Sensitivity to feared stimuli in obsessive-compulsives: A dichotic listening analysis. *Cognitive Therapy and Research,* 10, 477-485.

Foa, E. B., Steketee, G., & Rothbaum, B. O. (1989). Behavioural/cognitive conceptualization of Post-Traumatic Stress Disorder. *Behaviour Therapy,* 20, 155-176.

Foa, E.B., & Kozak, M.J. (1986). Emotional processing of fear: Exposure to corrective information. *Psychological Bulletin,* 99, 20-35.

Foa, E.B. & Riggs, D.S. (1994). Post-traumatic stress disorder and rape victims. In R. Pynoos (Ed.), Post-Traumatic Stress Disorder: A clinical review, Lutherviller: Sidran Press.

Foa E.B., Feske U., Murdock T.B., Kozak M.J., & McCarthy P.R. (1991). Processing of threat-related information in rape victims. *Journal of Abnormal Psychology*, 100, 156-163.

Foa, E.B., Zinbarg, R., & Rothbaum, B.O. (1992). Uncontrollability and unpredictability in post-traumatic stress disorder: An animal model. *Psychological Bulletin,* 112, 218-238.

Fox, E. (1993). Allocation of visual attention and anxiety. *Cognition and Emotion,* 7, 207-215.

Francis, W.N., & Kucera, H. (1982). *Frequency Analysis of English Usage.* Houghton & Mifflin: Boston, Mass.

Fundudis, T. (1989). Annotation: Children's memory and the assessment of possible child sex abuse. *Journal of Child Psychology and Psychiatry,* 30, 337-346.

Frederick, C.J., & Pynoos, R.S. (1988). *The Child Post-Traumatic Stress Disaster (PTSD) Reaction Index,* Los Angeles: University of California.

Freud, S., (1920). *Beyond the Pleasure Principle,* (Standard ed., Vol. 18). London: Hogarth Press.

Freud, A. (1936). *The Ego and the Mechanisms of Defence* (6th impression). London: Hogarth Press and the Institute of Psychoanalysis.

Freud, S. (1953). The Interpretation of dreams. In J. Strachey (Ed. and Trans.), *The standard edition of the complete psychological works of Sigmund Freud* (Vol. 4). London: Hogarth Press. (Original work published 1900).

Gil T., Calve A., Greenbece D., Kugelmass S. & Lerer B.(1989) Cognitive functioning in Post-Traumatic Stress Disorder. *Journal of Traumatic Sress,* 3, 29-45.

Gilligan, S.G. & Bower, G.H. (1984). Cognitive consequences of emotional arousal. In C. Izard, J. Kagan, & R. Zajonc (Eds.), *Emotions, Cognitions and Behaviour.*

New York: Cambridge University Press.

Gleser, G.C., Green, B.L. & Winget, C. (1981). *Prolonged Psychological Effects of Disaster: a Study of Buffalo Creek.* New York: Academic Press.

Goldstein G., Kammen W.V., Shelly C., Miller D. J. & Kammen D. (1987) Survivors of Imprisonment in the Pacific Theater During World War II. *American Journal Psychiatry,* 144, 1210 - 1213.

Goldston, D.B., Turnquist, D.C., & Knutson, J.F. (1989). Presenting problems of sexually abused girls receiving psychiatric services. *Journal of Abnormal Psychology, 98*, 314-317.

Goodman, G.S., Hirschman, J.E., Hepps, D., & Rudy, L. (1991). Children's memory for stressful events. *Merrill-Palmer Quarterly,* 37, 109-157.

Goozen, S. V., & Frijda, N. H. (1993). Emotion words used in six European Countries. *European Journal of Social Psychology*, 23, 89-95.

Gordon R. & Wraith R.(1993), Responses of children and adolescents to disaster. In J.P.Wilson & B.Raphael (Eds), *International Handbook of Traumatic Syndromes,* Plenum Press, New York & London.

Gotlib, I.H., Mclachlan, A.L., & Katz, A.N. (1988). Biases in visual attention in depressed and non-depressed individuals. *Cognition and Emotion,* 2, 185-200.

Gotlib, I.H. & Hammen, C.L. (1992). *Psychological aspects of depression toward a cognitive-interpersonal integration*. West Sussex, John Wiley & Sons Ltd.

Gotlib, I.H. & Cane, D.B. (1987). Construct accessibility and clinical depression: A longitudinal investigation. *Journal of Abnormal Psychology,* 96, 199-204.

Gotlib, I.H. & MacCann, C.D. (1984). Construct accessibility and depression: An examination of cognitive and affective factors. *Journal of Personality and Social Psychology,* 47, 427-439.

Graf, P.& Mandler, G. (1984). Activation makes words more accessible, but not necessarily more retrievable. *Journal of Verba Learning and Verbal Behavior,* 23, 553-568.

Graf, P., & Schacter, D.L. (1985). Implicit and explicit memory for new associations in normal and amnesic subjects. *Journal of Experimental Psychology: Learning, Memory, and Cognition,* 11, 501-518.

Graf, P., Squire, L.R., & Mandler, G. (1984). The information that amnesic patients do not forget. *Journal of Experimental Psychology Learning, Memory, and Cognition,* 10, 164-78.

Green, B.L., Korol M., & Grace M. (1991), Children and Disaster: Age, gender, and Parental effect on PTSD symptoms. *Journal of American Academic Child and Adolescent Psychiatry* 30, 945-951.

Green, B.L., Lindy J.D., & Grace M.C. (1989). Multiple diagnosis in posttraumatic stress disorder: The Role of War stressor. *Journal of Nervous Mental Diseases 177,* 329-335.

Grinker, R.R., & Spiegel, J. P. (1943). *War neurosis in North Africa, The Tunisian Campaign,* January to May 1943. New Yourk: Macy Foundation.

Grinker, R.R., & Spiegel, J. P. (1945). *Men under stress.* Philadephia: Blakiston.

Hag-Shenas, H., Goldstein L., & Yule W. (In press). *Neuropsychological aspects of PTSD: Laterality of cereberal hemispheres in the processing of trauma-related* *information*. Unpublished PhD thesis, Institue of Psychiatry, London.

Haist, F., Shimamura, A. P., & Squire, L. R. (1992). On the relationship between recall and recognition memory. *Journal of Experimental Psychology: Learning, Memory, and Cognition,* 18, 691-702.

Hamman C. & Zupan B.A. (1984). Self-schemas, depression, and processing of personal information in children. *Journal of Experimental Child Psychology*, 37, 598-608.

Harris, J.E. (1980). Memory aids people use: two interview studies. *Memory and Cognition,* 8, 31-38.

Heilman, K.M., Scholes, R., & Watson, RT (1974). Auditory affective agnosia. Journal of *Neurology and Neurosurgery Psychiatry,* 38, 69-79

Helmestetter, F.G. (1992). Contribution of amygdala to learning and performance of conditional fear. *Physiological Behaviour,* 51, 1271-1276.

Helweg-Larsen, P., Hoffmeyer, H., Kieler, J., Thaysen, E.H., Thaysen, J.H., Thygesen, P., & Wulff, M.H. (1952). Famine disease in German concentration camps: Complications and sequels. *Acta Medica Scandinavica,* 274, 235-460.

Helzer M.D., Robins L.N. & McEvoy L. (1987). Post-Traumatic Stress Disorder in the general population: Findings of the Epidemiologic Catchment Area Survey. *The New England Journal of Medicine.* 1630-1634.

Hill, A.B. & Knowles, T.H. (1991). Depression and the emotional Stroop effect. *Personality and Individual Differences*, 12, 481-485.

Hasher, L. & Zacks, R.T. (1979). Atomatic and effortful processes in memory. *Jounal of Experimental Psychology: General, 108*, 356-388.

Hibbert, G. A.(1984). Ideational components of anxiety: Their origin and content. *British Journal of Psychiatry*, 144, 618-624.

Hill, A.B., Dutton, F. (1989). Notes and shorter communications, depression and selective attention to self-esteem threatening words. *Personality and Individual Differences*, 10, 915-917.

Hochhaus, L. (1972). A table for the calculation of ***d'*** and ***B***. *Psychological Bulletin, 77,* 375-376.

Hope D.A., Rapee R.M., Heimberg R.G. & Dambeck M.J. (1990). Representations of the self in social phobia: Vulnerability to social threat. *Cognitive Therapy and Research,* 14, 177-189.

Horowitz, M.J. (1973). Phase-oriented treatment of stress response syndromes. *American Journal o Psychotherapy,* 27, 506-515.

Horowitz, M.J. (1976). *Stress response syndromes.* New York: Jason Aronson.

Horowitz., M.J., Wilner N., & Alvarez, Z.W. (1979). Impact of Event Scale: A measure of subjective stress. *Psychosomatic Medicine*, 41, 209-218.

Horowitz, M.J. (1990). A model of mouming: Changes in schemas of self and others. Journal *of the American Psychoanalytic Association,* 38, 297-324.

Horowitz, M.J., Wiener, N., Kaltreider, N., & Alvarez, W. (1980). Signs and symptoms of post-traumatic stress disorder. *Archives of General Psychiatry,* 37, 85-92.

Hughes, J., Worchel, F., Stanton, S., Stanton, H., Hall, B. (1990). Selective memory for positive and negative story content in children with high- and peer-rating of symptoms of depression. *School Psychology Quarterly*, 5, 265-279.

Huppert F. A. & Beardsall L. (1993), Prospective memory as an early indicator of dementia. *Journal of Clinical and Experimental Neuropsychology,* 151, 805 - 821.

Izard C.E. (1993). Four systems for emotion activation: Cognitive and noncognitive processes. *Psychological Review.* 100. 68-90.

Jacoby, L. L. (1983). Remembering the data: Analyzing interactive processes in reading. *Journal of Verbal Learning and Verbal Behaviour,* 22, 485-508.

Joseph, S.A., Brewin, C.R., Yule, W., & Williams, R. (1993). Causal attributions and post-traumatic stress in children. *Journal of Child Psycholoqy and Psychiatry,* 34, 247-253.

Janoff-Bulman, R. (1985). *The Aftermath of victimisation: Rebuilding shattered assumptions.* In C.R. Figley (Ed.), Trauma and its wake: The study and treatment of posttraumatic stress disorder. New York: Brunner/ Mazel.

Janoff-Bulman, R. (1992). *Shattered assumptions: Towards a new psychology of trauma.* New York: The Free Press.

John, C. H. (1988). Emotionality ratings and free-association norms of 240 emotional and non-emotional words. *Cognition and Emotion*, 2, 49-70.

Johnson-Laird, P. N. & Oatley K. (1989). The language of emotions: An analysis of a semantic field. *Cognition & Emotion*, 3, 81-123.

Joseph, S.A., Yule, W., Williams, R., & Hodgkinson, P. (1994). The Herald of Free Enterprise disaster: Correlates of distress at thirty months. *Behaviour Research and Therapy,* 32, 521-524.

Joseph, S.A., Brewin, C.R., Yule, W., & Williams, R. (1991). Causal attributions and psychiatric symptoms in survivors of the Herald of Free Enterprise disaster, British Journal of Psychiatry, 159, 542-546.

Jaenicke, C., Hammen, C., Zupan, B., Hiroto, D., Gordon, D., Adrian, C., & Burge, D. (1987). Cognitive vulnerability in children at risk. *Journal of Abnormal Child Psychology*, 15, 559-572.

James, W. (1890). *Principles of psychology*. New York: Holt

Kanfer, F.H., & Hagerman, S. (1981). The Role of self-regulation. In L. Rehm (Ed.), *Behaviour Therapy for Depression: Present status and future directions*, San Diego: Academic.

Kaspi, S.P. & McNally, R.J. (1991). *Selective processing of idiographic emotional information in PTSD.* Paper presented at the association for advancement of behaviour therapy, New.York.

Keane T.M., Weathers F.M., Kaloupek D.G. (1992). Psychological assessment of post-traumatic stress dosorder. The National Center for Post-Traumatic Stress Disorder: PTSD *Research Quarterly,* 3, 1-7.

Keane, T.M., Zimmerling, R.T., & Caddell, J.M. (1985). A behavioural formulation of posttraumatic stress disorder in Vietnam veterans. *The Behaviour Therapist,* 8, 9-12.

Kellett, A. (1982). *Combat motivation: The Behaviour of soldiers in battle.* Boston: Kluwer-Nijhoff.

Kelly S., (1990) Parental stress responses to sexual abuse and ritualistic abuse of children in day care centers. *Nursing Research.* 39, 25-29.

Keppel-Benson, J. M., & Ollendick, T. H. (1993). Post-Traumatic Stress Disorder in Children and Adolescents. In C.F. Saylor (Ed.). *Children and Disasters*. Plenum Press. Newyork and London.

Kesner RP (1992). Learning and memory in rats with emphasis on the role of amygdala. In J.A. Aggelton (Ed.), *The Amygdala: Neurobiological aspects of emotion, memory, and mental dysfunction*, New York: Wiley-Liss.

Kijak, M., & Funtowicz, S. (1982). The syndrome of the survivor of extrem situations. *International Review of Psychoanalysis*, 9, 25-33.

Kilieger D.M. & Cordner, M.D. (1989). The Stroop task as measure of construct accessibility in depression. *Personality and Individual Differences*, 11, 19-27.

Kilpatrick, D.G., Veronen, L.J., & Best, C.L. (1 985). Factors predicting psychological distress among rape victims. In C. R. Figley (Ed.), *Trauma and its wake*. New York: Brunner/Mazel.

Kinderman, P. (1994). Attentional bias, persecutory delusions and the self-concept. *British Psychological Society*, 67, 53-66.

Kinsbourne. M., (1994). Development of attention and metacognition. In S. J. Segalowitz & I., Rapin, (Eds.).*Handbook of Neuropsychology, Vol. 7: Child Neuropsychology*; F. Boller and J. Grafman (Series Eds).

Kleber, R.J., & Brom, D. (1992). *Coping with Trauma: Theory, Prevention and Treatment*. ***Swets & Zeitlinger Publisher.

Klieger, D.M. & Cordner, M.D. (1990). The Stroop task as measure of construct accessibility in depression. *Personality and Individual Differences, 11*, 19-27.

Klonoff, H., McDougall, G., Clark, C., Kramer, P., & Horgan, J. (1976). The neuropsychological, psychiatric, and physical effects of prolonged and sever stress: 30 years later. *The Journal of Nervous and Mental Disease.* 163, 246-252.

Kovacs, M. & Beck, A.T. (1977). An empirical-clinical approach toward a definition of childhood depression. In J.G. Schulterbrandt & A. Raskin (Eds), *Depression in Children: Diagnosis, Treatment, and Conceptual Models*. New York: Raven Press.

Kovacs, M. (1982). *The children's Depression Inventory.* Unpublished manuscript, University of Pittsburgh.

Lang, P.J. (1977). Imagery in therapy: An information processing analysis of fear, *Behaviour Therapy,* 8, 862-886.

Lang, P.J. (1979). A Bio-informational theory of emotional imagery. *Psychophysiology,* 16, 495-512.

Lang, P.J. (1985). *The cognitive psychophysiology of emotion: Fear and anxiety.* In A.H.

Langhinrichsen, J, & Horton M (1988). Utility of the Four Word Short-term memory test as a measure of cognitive impairment with alcoholics hospitalised for detoxification. *Paper presented at the Annual Meeting of the American Psychologist Association,* Atlanta, Georgia.

Last C.G.(1993); Anxiety Across the Life Span "*A developmental Perspective*", New York, Springer.

Lavy, E., Hout, M.V.D., & Arntz, A. (1993). Attentional bias and spider phobia: Conceptual and clinical issues, *Behaviour Research and Therapy*, 31, 17-24.

Lazarus, R.S. (1982). Thoughts on the relation between emotion and cognition. *American Psychologist.* 37, 1019-1024.

LaDoux, JE (1992). Emotion and amygdala. In JA Aggelton (Ed.), *The Amygdala: Neurobiological aspects of emotion, memory, and mental dysfunction,* New York, Wiley-Liss.

Levy, R.L. & Loftus, G.R. (1984). Compliance and memory. In J.E. Harris, & P.E. Morris (Eds), Every day memory, actions and absentmindeness. *** Accademic press.

Lonigan, C.J., Shannon, M.P., Finch, A.J., Daugherty, T.K., & Saylor, C.M. (1991). Children's reactions to a natural disaster: Symptoms severity and degree of exposure. *Advances in Behaviour research and Therapy,* 13, 135-154.

Lowenstein RJ., & Putnam FW. (1988). A comparison study of dissociative symptoms in patients with complex partial seizures, MPD, and posttraumatic stress disorder. *Dissociation* 1, 17-23.

Lyons J.A. (1987), Post-Traumatic Stress Disorder in Children and Adolescents: A review of the Literature. *Annual Progress in Child Psychiatry and Development.* 451-467.

MacLeod, C. (1994). Stroop effect. In M.W. Eysenck (Ed.) *Blackwell Dictionary of Cognitive Psychology.* London, Blackwell Ltd.

MacLeod, C. (1990). Mood disorder and cognition. In M.W. Eysenck (ed.), *Cognitive Psychology: An International review.* New York, Wiley.

MacLeod, C.M. (1992). The Stroop task: The "Gold Standard" of attentional measures. *Journal of Experimental Psychology: General,* 121, 12-14.

MacLeod, C.M. (1991). Half a century of research on the Stroop effect: An integrative review. *Psychological Bulletin,* 109, 163-203.

MacLeod, C. & McLaughlin, K. (1995). Implicit and explicit memory bias in anxiety: A conceptual replication. *Behaviour, Research and Therapy,* 33, 1-14.

MacLeod, C., Mathews, A., Tata, P. (1986). Attentional bias in emotional disorders. *Journal of Abnormal Psychology,* 95, 15-20.

MacLeod, C. & Hagan, R. (1992). Individual differences in the selective processing of threatening information, and emotional responses to a stressful life event. *Behavior Research and Therapy,* 30, 151-61.

MacLeod, C. & Mathews, A. (1988). Anxiety and the allocation of attention to threat. The Quarterly *Journal of Experimental Psychology,* 40, 653-670.

MacLeod, C. & Mathews, A. (1991). Biased cognitive operations in anxiety: Accessibility of information or assignment of processing priorities? *Behaviour Research and Therapy,* 29, 599-610.

Mandler, G. (1980). Recognizing: The judgment of previous occurrence. *Psychological Review,* 87, 252-271.

Martin, M., Williams, R.M., & Clark, D.M.(1991). Does anxiety lead to selective processing of threat related information? *Behaviour Research and Therapy.* 29, 147-160.

Martin, M., Ward, J.C., & Clark, D.M. (1983). Neuroticism and the recall of positive and negative personality information. *Behaviour, Research and Therapy,* 221, 495-503.

Martin, M., Horder, P. & Jones, G.V. (1992). Integral bias naming of phobia-related words. *Cognition & Emotion,* 6, 479-486.

Mathews, A., & MacLeod, C. (1986). Discrimination of threat cues without awareness in anxiety states. *Journal of Abnormal Psychology,* 95, 131-138.

Mathews, A. & Klug, F. (1993). Emotionality and interference with colour-naming in anxiety. *Behaviour Research and Therapy,* 27, 57-6.

Mathews, A., Williamson, D.A., Fuller, R.D. (1992). Mood-congruent memory in depression: Emotional priming or elaboration? *Journal of Abnormal Psychology,* 101, 581-586.

Mathews, A. (1993). Biases in processing emotional information. *The Psychologist: Bulletin of the British Psychological Society,* 6, 493-499.

Mathews, A., Mogg, K., May, J., & Eysenck, M. (1989). Implicit and explicit memory bias in anxiety. *Journal of Abnormal Psychology, 98* (3), 236-240.

Mathews, A., Mogg, K., May, J., & Eysenck, M. (1989). Implicit and explicit memory biases in anxiety. *Journal of Abnormal Psychology,* 98, 236-240.

Mathews, A. & MacLeod, C. (1994). Cognitive approaches to emotion and emotional disorders. *Annual Review of Psychology,* 45, 25-50.

Mathews, A., & MacLeod, C. (1985). Selective processin g of threat cues in anxiety states. *Behaviour Research and Therapy,* 23, 563-569.

Mathews, A., May, J., Mogg, K., & Eysenck, M.W. (1990). Attentional bias in anxiety: Selective search or defective filtering? *Journal of Abnormal Psychology,* 99, 166-173.

Mathews, A. & Bradley, B.P. (1983). Mood and the self-reference bias in recall. *Behavior Research and Therapy,* 21, 233-239.

Mayes, A.R. (1988). *Human organic memory disorders.* Cambridge: Cambridge University Press.

McFall, M.E., Murburg M.M., & Ko G.N. (1990). Automatic response to stress in Vietnam combat veterans with post-traumatic stress disorder. Biological Psychiatry, 27, 1156-1175.

McCaffery, R.J., Lorig, T.S., Pendrey D.L., McCutcheon, ND. & Garrwtt, J.C. (1993). Odor-induced EEG changes in PTSD Vietnam veterans. *Journal of Traumatic Stress,* 6, 213-224.

McFarlane, A.C. (1988). The longitudinal course of Post-traumatic morbidity. *Journal Nervous Mental Disorders,* 176;30-39.

McFarlane, A.C. (1989). The aetiology of post-traumatic morbidity: Predisposing, precipitating and perpetuating factors. *British Journal of Psychiatry,* 154, 221-228.

McFarlane, A.C. (1987). Familiy functioning and overprotection following a natural disaster: the longitudinal effects of Post-Traumatic morbidity. *Australia and New Zealand Journal of Psychiatry,* 21, 210-218.

McNally, R.J., Lasko, N.B., Macklin, M.L., & Pitman, R.K. (1995). Autobiographical memory disturbance in combat-related posttraumatic stress disorder. *Behaviour Research and Therapy.*33, 619-930

McNally, R.J., Litz, B.T. Prassas, A., Shin, L.M., & Weathers, F.W. (1994). Emotional priming of autobiographical memory in post-traumatic stress disorder. *Cognition* *and Emotion,* 8, 351-368.

McNally RJ (1991), Assessment of Post-Traumatic Stress Disorder in Children. *Psychological Assessment,* 3, 531-537.

McNally, R.J., Amir, N., Louro, L.E., Lukach, B.M., Riemann, B.C., & Calamari, J.E. (1994). Cognitive processing of idiographic emotional information in Panic disorders. *Behaviour Research & Therapy,* 32, 119-122.

McNally, R.J., Foa, E.B., & Donnell, C.D. (1989). Memory bias for anxiety information in patients with panic disorders. *Cognition and Emotion,* 3, 27-44.

McNally, R.J., Riemann, B.C., & Kim, E. (1990). Selective processing of threat cues in panic disorder. *Behaviour Research & Therapy,* 28, 407-412.

McNally, R.J. (1995). Automaticity and the anxiety disorders. *Behaviour Research and Therapy,* 33, 747-754.

McNally, R.J., English, G.E., & Lipke, H.J. (1993) Assessment of Intrusive Cognition in PTSD; "Use of the modified Stroop paradigm". *Journal of Traumatic Stress,* 6, 33-41.

McNally, R.J., Kaspi, S.P., Riemann, B.C., & Zeitlin, S.B. (1990). Selective processing of threat cues in posttraumatic stress disorder. *Journal of Abnormal Psychology.* 99, 398-402.

McNally, R.J., Riemann, B.C., Louro, C.E., Lukach, B.M., & Kim, E. (1992). Cognitive processing of emotional information in panic disorder. *Behaviour Research & Therapy,* 30, *143-149.*

McNally, R.J. (1990). Psychological approaches to panic disorders: A review.

Psychological Bulletin, 108, 403-419.

McNally, R.J. (1995). Cognitive processing of trauma-relevant information in PTSD. *PTSD Research Quarterly*. 2, 1-6.

Meacham J., & Leiman B. (1982). Remembering to perform future actions. In U. Neisser (Ed), *Memory Observed*. San Francisco: W.H. Freeman.

Mellman T.A., Kulick B.R., Ashlock L.E., & Nolan B., (1995). Sleep events among veterans with combat-related post-traumatic stress disorder. *American Journal of Psychiatry*, 152, 110-115.

Mogg K.(1992) Recollective Experience & Recognition memory for Threat in clinical anxiety states; *Bulletin of the Psychonomic Society*, 30, 109-112.

Mogg, K., Bradley, B.P., Williams, R., & Mathews, A. (1993). Subliminal processing of emotional information in anxiety and depression. *Journal of Abnormal Psychology*, 102, 304-311.

Mogg, K., Mathews, A., & Weinman, J. (1989). Selective processing of threat cues in anxiety states: A replication. *Behaviour Research and Therapy*, 22, 317-333.

Mogg, K., Mathews, A., & Eysenck, M.W. (1992). Attentional bias to threat in clinical anxiety states. *Cognition & Emotion*, 6, 149-159.

Mogg, K., Mathews, A., Eysenck, M.W., & May, J. (1991). Biased cognitive operations in anxiety: artefacts, processing priorities, or attentional search? *Behaviour Research & Therapy*, 29, 459-467.

Mogg, K., Mathews, A. & Weinman, J. (1987). Memory bias in clinical anxiety. *Journal of Abnormal Psychology, 96 (2)*, 94-98.

Mogg, K. & Marden, B. (1990). Processing of emotional information in anxious subjects. *British Journal of Clinical Psychology,* 29, 227-229.

Mogg, K., Mathews, A., May, J., Grove, M., Eysenck, M.W., & Weinman, J. (1991). Assessment of cognitive bias in anxiety & depression using a colour perception task. *Cognition & Emotion, 5,* 221-238.

Mogg, K., Mathews, A., & Weinman, J. (1987). Memory bias in clinical anxiety. *Journal of Abnormal Psychology,* 96, 94-98.

Mogg, K., Mathews, A., May, J., Grove, M., Eysenck, M., & Weinman, J. (1991). Assessment of cognitive bias in anxiety and depression using a colour perception task. *Cognition and Emotion,* 5, 221-238.

Mogg, K., Mathews, A., Bird, C., & MacGregor-Morris, R. (1990). Effects of stress and anxiety on the processing of threat stimuli. *Journal of Personality and Social Psychology,* 59, 1230-1237.

Morris, R.J., & Kratochwill, T.R. (1983). *Treating children's fears and phobias.* New York: Pergamon press.

Mott F.W. (1919). *War Neuroses and Shell Shock.* London: Oxford Medical Publications.

Motta, R.W., Suozzi, J.M., & Joseph, J.M. (1994). Assessment of secondary traumatization with an emotional Stroop task. *Perceptual and Motor Skills,* 78, 1274.

Mowrer, 0. H. (1947). On the dual nature of learning: A reinterpretation "of conditioning" and "problem-solving." *Harvard Educational Review,* 17, 102-148.

Myers, C. S. (1940). *Shell shock in France, 1914-1918.* Cambridge: Cambridge University Press.

Nadel, L. & Jacobs W.J. (1995). The role of the Hippocampus in PTSD, panic and phobia. To be published in N. Kato (Ed.) *Hippocampus: Functions and Clinical Relevance*, Amsterdam, Elsevier science B.V.

Nadel, L. (1994). Multiple Memory Systems: What and why, an Update. In *Memory Systems,*Schacter D. L., & Tulving E. (Eds.), Massachusetts Institute of Technology. 39-63.

Nader K., Pynoos R., Fairbanks L., & Frederick C. (1990), Children's PTSD Reactions One Year After A Sniper Attack at Their School. *American Journal of Psychiatry,* 147, 1526- 1530.

Nader K., Pynoos R., Fairbanks L., & Frederick C. (1991). Childhood PTSD reactions one year after a sniper attack. *American Journal of Psychiatry,* 147, 1526-1530.

Neely, J. H. (1977). Semantic priming and retrival from lexical memory: The roles of inhibitionless spreading activation and limited-capacity attention. *Journal of Experimental Psychology: General*, 106, 226-254.

Neshat-Doost H.T. (1996). *Cognitive characteristics of clinical depression in children and adolescents*. Unpublished Ph.D thesis. University of London.

Neshat-Doost H.T., Moradi A.R., Taghavi S.M.R., Yule W. & Dalgleish T. (In press). The Development of a corpus of emotional words produced by children and adolescents. *Cognition & Emotion.*

Neshat-Doost, H.T., Taghavi, S.M.R., Moradi, A.R., Yule, W. & Dalgleish, T. (1996). *The performance of depressed children on the Stroop colour naming paradigm.*

Paper presented at the Annual Conference of the British Psychological Society, Brighton.

Neshat-Doost, H.T., Moradi, A.R., Taghavi, S.M.R., Yule, W. & Dalgleish T. (1996). The development of a corpus of emotional words produced by children and adolescents. *Manuscript submitted for publication.*

Nilsson L. G. (1993). Memory functions across the adult life span. Paper presented in *III European Congress of Psychology*, July 4-9, 1993, Tampere, Finland

Oatley, K., & Johnson-Laird, P.N. (1987). Towards a cognitive theory of emotions. *Cognition and Emotion,* 1, 29-50.

O'Keefe J & Nadel L (1978). *The Hippocampus as a cignitive Map.* Oxford: The Calrendon Press.

Ollendick, T.H., Matson, J.L., & Helsel, W.J. (1985). Fears in children and adolescents: Normative data. *Behaviour Research and Therapy,* 23, 465-467.

Orr, S. P., Pitman, R. K., Lasko, N. B., & Herz, L. R, (1993). Psychophysiologic assessment of post-traumatic stress disorder imagery in World War II and Korean combat veterans. *Journal of Abnormal Psychology,* 102, 152-159.

Osborn, R.G. & Meador (1990). The Memory performance of selected depressed and nondepresed nine- to eleven-year-old male children. *Behavioural Disorders,* 16, 32-38.

Ollendick, T.H., Yule, W., Olliver, K. (1991). Fears in British children and its relationship to manifest anxiety and depression. *Journal of Child Psychology and Psychiatry,* 3, 321-331.

Page, H. (1885). *Injuries of the spine and spinal cord without apparent mechanical lesion*. London: J. & A. Churchill.

Palmer, L.K. (1995). *Neuropsychological sequelae in psychologically traumatised children*. Unpublished Ph.D., University of Hoston.

Pallmeyer T.P., Blanchard E.B., & Kolb L.C. (1986). The psychophysiology of combat-induced posttraumatic stress disorder in Vietnam veterans. *Behaviour Research & Threapy*, 24, 645-652.

Papay, J.P. & Spielberger, C.D. (1986). Assessment of anxiety and achievement in kindergarten and first- and second- grade children. *Journal of Abnormal Child Psychology*, 14, 279-286.

Parkin A.J. (1987). *Memory and Amnesia*, Oxford: Basil Blackwell Inc, 30-37.

Parkin A.J., & Streete S., (1988). Implicit and explicit memory in young children and adults. *British Journal of Psychology*, 79, 361-369.

Parkinson, L. & Rachman, S. (1981). Intrusive thoughts: The effects of an uncontrived stress. *Advances in Behaviour Research and Therapy*, 3, 111-118.

Perry, B. D. (1994). Neurobiological sequelae of childhood trauma. Post-traumatic stress disorders in children. In M. Murberg (Ed.), *Catecholamine function in post-traumatic stress disorder: Emerging concepts*. Washington, DC: American Psychiatric Press.

Petrson, K.C., Prout, M.F., & Schwarz, P.F. (1991). Post-Traumatic Stress Disorder (A clinician's Guide), Plenum Press. NewYork and London.

Pitman, R. K., Orr, S. P., Forgue, D. F., Altman, B., de Jong, J. B., & Herz, L. R. (1990).

Psychophysiologic responses to combat imagery of Vietnam veterans with post-traumatic stress disorder versus other anxiety disorders. *Journal of Abnormal Psychology,* 99, 49-54.

Pitman, R. K., Orr, S. P., Forgue, D. E, de Jong, J. B., & Claiborn, J. M. (1987). Psychophysiologic assessment of posttraumatic stress disorder imagery in Vietnam combat veterans. *Archives of General Psychiatry.* 44, 970-975.

Pitman, R.K. (1993). Biological Findings in Posttraumatic Stress Disorder: Implications for DSM-IV Classification. In Davidson J.R.T., & Foa E.B. (Eds.), *Post-Traumatic Stress Disorder: DSM-IV and beyond,* American Psychiatric Press.

Pitman, R.K., & Orr, S. (1995) *Psychophysiology of Emotional Memory Networks in Posttraumatic Stress Disorder.* In Brain and Memory, J.L. McGaugh, N. Weinberger & G. Lyach (Eds). New York and Oxford. Oxford Press University.

Polster, M. R., Nadel, L., & Schater, D. L., (1991). Cognitive neuroscience analysis of memory: A historical perspective. *Journal of Cognitive Neuroscience,* 3, 95-116.

Posner M.I. (1980). Orienting of attention. *The Quarterly Journal of Experimental Psychology,* 32, 3-25.

Power, & Dalgleish, T. (In press) *Cognition and Emotion: From Order to Disoders.* UK: Elbaum, Hove.

Putnam, J. J. (1881). Recent investigations into patients of so-called concussion of the spine, *Boston Medical and Surgical Journal,* 109, 217.

Pynoos, R., Nader, K., & March, J. (1991). Childhood post-traumatic stress disorder. In J. Weiner (Ed.), *The Textbook of Child and Adolescent Psychiatry.* Washington, DC: American Psychiatric Press.

Pynoos, R.S., Steinberg A.N., & Wraith R. (1995). A Developmental Model of Childhood Traumatic Stress. In D. Ccchetti & D.J. Cohen (Eds), *Developmental Psychopathology*, Vol 2,. New York: Wiley

Pynoos, R., Goenjian, A., Tashjian, M., Karakashian, M., Manjikian, R., Manoukian, G., Steinberg, A., & Fairbanks, L. (1993). Posttraumatic stress reactions in children after the 1988 Armenian earthquake. *British Journal of Psychiatry,* 163, 239-247.

Pynoos, R.S., Frederick, C., Nader, K., Arroyo, W., Steinberg, A., Eth, S., Nunez, F., & Fairbanks, L. (1987). Life threat and posttraumatic stress in school-age children. *Archives of General Psychiatry,* 44, 1057-1063.

Pynoos, R., & Nader, K. (1988). Children who witness the sexual assaults of their mothers. *Journal of the American Academy of Child and Adolescent Psychiatry,* 27, 567-572.

Pynoos, R., & Nader, K. (1993). Issues in the treatment of post-traumatic stress in children and adolescents. In J. P. Wilson & B. Raphael *(Eds.), International handbook of traumatic stress syndromes* (pp. 535-549). New York: Plenum.

Rachman, S. (1980). Emotional processing, *Behavioural Research and Therapy,* 18, 51-60.

Rado, S. (1942). Pathodynamics and treatment of traumatic war neurosis (traumatophobia). *Psychosomatic Medicine,* 42, 363-368.

Rainey, J.M., Aleem A., & Ortiz A. (1987). A Laboratory procedure for the induction of flashbacks. *American Journal of Psychiatry* 144, 1317-1319.

Ramsy, R. (1990) Invited Review: Post-traumatic Stress Disorder; A New Clinical

Entity? *Journal of Psychosomatic Research*, 34, 355-365.

Rapee, R.M., McCallum, S.L., Melville, L.F., Ravenscroft, H., & Rodney, J.M. (1994). Memory bias in social phobia. *Behaviour, Research and Therapy,* 32, 89-99.

Rapoport, J.L., Buchsbaum, M.S., Weingartner, H., Zahn, T., Ludlow, C. & Mikkelsen, E. (1980). Dextro-amphetamine: Its cognitive and behavioural effects in hyperactive boys and normal men. *Archives of General Psychiatry,* 37, 933-943.

Rauch SL, van der Kolk BA, Fisler RE, Alpert NM, Orr SP, Savage CR, Fischman AJ, Jenike MA, & Pitman RK (in press). Asymptom provocation study of posttraumatic stress disorder using Poistron Emission Tomography and script-driven imagery. *Archives of General Psychiatry.*

Ray, C. (1979). Examination stress and performance on a colour-word interference test. *Perceptual and Motor Skills,* 49, 400-402.

Reynolds, C.R., & Paget, K.D. (1981). Factor analysis of the Revised Children's Manifest Anxiety Scale for blacks, whites, males, and females with a national normative sample. *Journal of Consulting and Clinical Psychology,* 49, 352-359.

Reynolds, C.R., & Richmond, B.D. (1978). What I Think and Feel: a Revised Measure of Children Manifest Anxiety. *Journal of Abnormal Child Psychology,* 6, 271-280.

Reynolds, C.R., & Richmond, B.O. (1985) *Revised Children's Manifest Anxiety Scale Manual.* LosAngeles: Western Psychological services.

Richards, A., & Millwood, B. (1989). Colour Identification of differentially valanced words in anxiety. *Cognition & Emotion,* 3, 171-176.

Richards, A., & French, C.C. (1991). Effects of encoding and anxiety on implicit and explicit memory performance. *Personality and Individual Differences,* 2, 131-139.

Richards, A., French, C.C., Johnson, W., Naparstek, J. & Williams, J. (1992). Effects of mood manipulation and anxiety on performance of an emotional Stroop task. *British Journal of Psychology*, 83, 479-491.

Rigler, R. (1879). In Foa, E. B., Steketee G. & Rothbaum B. O. (1989). Behavioural/Cognitive Conceptuatization of Post-Traumatic Stress Disorder. *Behaviour Therapy,* 20, 155-176.

Rudy, J. W., & sutherland, R. J., (1992). Configural and elemental association and the memory coherence problem. *Journal of Cognitive neuroscience,* 4, 208-216.

Rust, J., Golombok, S. & Trickey, G.(1993). *Wecheler Objective Reading Dimensions*, UK: The Psychological Corporation, Harcourt Brace Jovanovich Publishers.

Rusted, J. & Dighton, K. (1991). Selective processing of threat-related material by spider phobics in a prose recall task. *Cognition and Emotion*, 5, 123-132.

Saigh, P. A. (1989). The development and validation of the Childrens's Posttraumatic Stress DisorderInventory. *International Journal of Special Education,* 4, 75-84.

Saigh, P. A. (1991) The development of posttraumatic stress disorder following four different types of traumatization, *Behavioural research and Therapy,* 29. 213-216.

Saywitz, K.J. (1987). Children's testimony: age-related patterns of memory errors. In S.J. Ceci, M. P. Toglia & D.F. Ross (Eds), *Children's eyewitness memory.* New York: Springer-Verlag.

Schacter, D.L. (1987). Memory, amnesia, and frontal lobe dysfunction. *Psychobiology,* 15, 21-36.

Schacter, D.L. (1987). Implicit expressions of memory in organic amnesia: Learning of new facts and associations. *Human Neurobiology*, 6, 107-118.

Schacter, D.L. (1987). Implicit memory: History and current status. *Journal of Experimental Psychology Learning, Memory, and Cognition,* 13, 501-518.

Schacter, D. L. (1992). Understanding implicit memory: A cognitive neuroscience approasch. *American Psychologist,* 47, 559-569.

Schacter, D. L., (1994). Priming and Multiple Memory Systems: Perceptual Mechanisms of Implicit memory. In D.L. Schacter & E. Tulving (Eds.), *Memory Systems,* Massachusetts Institute of Technology.

Schacter, D.L., & Graf, P. (1986). Preserved learning in amnesic patients: Perspective from research on direct priming. *Journal of Clinical and Experimental Neuropsychiatry,* 8, 727-743.

Schneider, S., Unnewher, S., Florin, I. & Margraf, J.(1992). Cognitive characteristics of children of panic patients. *International Congress of Psychology.* Brussels.

Schwarz D., Kowalski J.M., & McNally R.J. (1993), Malignant memories: Post-traumatic changes in memory in adults after a school shooting. *Journal of Traumatic Stress,* 6, 545-553.

Schwarz E. D., & Perry B. D. (1994), Post-traumatic response in children and adolescents; *The Psychiatric Clinics of North America*; 17, 311-326.

Segal, Z.V., Hood, J.E., Shaw, B.F., & Higgins, E.T. (1988). A structural analysis of the self-schema construct in major depression. *Cognitive Therapy and Research,* 12, 471-485.

Shalev, A.Y., Orr, S.P., & Pitman, R.K. (1993). Psychophysiologic assessment of traumatic imagery in Israeli civilian post-traumatic stress disorder patients. *American Journal of Psychiatry,* 150, 620-624.

Shiffrin, R. M., & Schneider, W. (1977). Controlled and automatic human information processing: II Perceptual learning, automatic attending and a general theory. *Psychological Review,* 84, 127-190.

Siegel D.J. (1993, unpublished). Memory and Trauma: *A Cognitive Science View.*

Spiegel D, Hunt T, Dondershine HE, (1988); Dissociation and hypnotizability in posttraumatic stress disorder. *American Journal Psychiatry* 145, 301-305.

Spielberger, C.D., Gorsuch, R.L. & Lushene, R.E. (1983). *STAI Manual for the State-Trait Anxiety Inventory.* California: Consulting Psychologists Press.

Squire. L. R., (1986). Mechanisms of Memory. *Science,* 232, 1612-1619.

Squire, L. R., (1987). Memory and brain. New York: Oxford University press.

Squire, L. R., (1992). Declarative and nondeclarative memory: Multiple brain systems supporting learning and memory. *Journal of Cognitive Neuroscience,* 99, 195-231.

Stroop, J.R. (1935). Studies of interference in serial verbal reactions. *Journal of Experimental Psychology,* 18, 643-662.

Sutker, P.B., Allian, A.N., & Winstead, D.K. (1987). Cognitive performances in former

War II and Korean-Conflict POWs. *VA Practitioner,* 4, 77-85.

Sutker P. B., Galina Z. H. & West J. A. (1990), Trauma-Induced Weight Loss and Cognitive Deficits Among Former Prisoners of War. *Journal of Consulting and Clinical Psychology,* 58, 323-328.

Sutker, P.B., Winstead, D.K., Galina, Z.H., & Allain, A.N. (1991). Cognitive deficits and psychopathology among former prisoners of War and combat veterans of the Korean Conflict. *American Journal of Psychiatry,* 148, 67-72.

Sutker P.B., Vasterling J.J., Brailey K.,& Allain A.J. (1995), Memory, Attention, and Executive Deficits in POW Survivors: Contributing Biological and Psychological Factors. *Neuropsychology,* 9, 118-125.

Stuman R.K., & Bliss E.L. (1985). Posttrumatic stress disorder, hypnotizability, and imagery. *American Journal of Psychiatry,* 142, 741-743.

Taghavi, M.R. (1996). *The cognitive characteristics of children and adolescents with anxiety.* Unpublished PhD thesis, Institute of Psychiatry, London.

Taghavi, S.M.R., Neshat-Doost, H.T., Moradi, A.R., Yule, W. & Dalgleish, T. (1996). Biases in visual attention in children and adolescents with Generalized Anxiety Disorder. *Poster presented at the Annual Conference of the British Psychological Society,* Brighton.

Taghavi, S.M.R., Neshat-Doost, H.T., Moradi, A.R., Yule, W. & Dalgleish, T. (1996). Emotional information processing in clinically anxious children and adolescents. *Paper presented at the Annual Conference of the British psychological society.* Brighton.

Taghavi, S.M.R., Neshat-Doost, H.T., Moradi, A.R. & Yule, W. (1995). Memory problems in children with PTSD. *Poster presented at the IV European Conference:* Paris.

Thrasher, S.M., Dalgleish, T., & Yule, W. (1994). Information processing in Post-traumatic stress disorder. *Behavioural Research & Therapy,* 32, 247-254.

Terr, L. C. (1988). What happens to early memories of trauma? A study of twenty children under age five at the time of documented traumatic events. *Journal of the American Academy of Child and Adolescent Psychiatry,* 27, 96-104.

Terr, L.C. (1983), Chowchilla Revisited: The Effects of Psychic Trauma: Four Years After a School-Bus Kidnapping; *American Journal of Psychiatry* 140:12, 1543-1550.

Terr, L. C. (1991). Childhood traumas-An outline and overview. *American Journal of Psychiatry,* 148, 10-20.

Trimble, M. R. (1981). *Post-traumatic neurosis: From railway spine to the whiplash.* Chichester: Wiley.

Tulving, E. (1972). Episodic and semantic memory. In E. Tulving & W. Donaldson (Esd.), *Organization of memory,* New York: academic Press.

Tulving, E. (1982). Synergistic ecphory in recall and recognition. *Canadian Journal of Psychology,* 36, 130-147.

Tulving, E. (1985). How many memory systems are there?*American Psychologist, 40 (4)*, 385-398.

Tulving, E. (1985). Ebbinghaus's memory: What did he learn and remember? *Journal of Experimental Psychology Learning, Memory, and Cognition,* 11, 485-490.

Tulving, E. (1985). Memory and consciousness. *Canadian Psychology.*, 26, 1-12.

Tulving, E. (1984). Precis of Elements of episodic memory. *Behavioral and Brain Sciences*, 7, 223-268.

Tulving, E. (1991). Concepts of human memory. In L. R. Squire, N. M. Weinburger, G. Lynch, & J. L. McGaugh (Eds.), *Memory: Organization and locus of change*, New Yourk: Academic Press.

Tulving, E., & Schacter, D. L. (1990). Priming and human memory systems. *Science*, 247, 301-306.

Tulving, E. & Thomson, D.M. (1973). Encoding specificity and retrieval processes in episodic memory. *Psychological Review*, 80, 359-380.

Tulving, E. (1993). What is episodic memory. *Current Perspectives in Psychological Science*,2, 67-70.

Tversky, A. & Kahneman, D. (1974). Judgement under uncertainty: Heuristics and biases in judgments reveal some heuristics of thinking under uncertainty. *Science*, 185, 1124-1131.

Van der Hart, O. Brown, P. & Van der Kolk BA.(1989). Pierre Janet's treatment of posttraumatic stress. *Journal of Traumatic Stress*, 2, 379-395.

Van der Kolk BA. (1988). The trauma Spectrum: The interaction of biological and social events in genesis of the trauma response. *Journal of Traumatic Stress*; Vol 1: 273-290.

Van der Kolk BA., Brown, P. & Van der Hart, O. (1989). Pierre Janet on post-traumatic stress. *Journal of Traumatic Stress*, 2, 365-378.

Van der Kolk BA., Greenberg MS., & Orr SP. (1989). Endogenous opioids, stress induced analgesia, and post traumatic stress disorder, *Psychopharmacological Bulletin* 25: 417-421.

Van der Kolk BA. (1994). The body keeps the score: Memory and the evolving psychobiology of posttraumatic stress. *Harvard Review. Psychiatry.* 1: 253-265.

Vandermaas, M.O., Hess, T.M., & Baker-Ward, L. (1993). Does anxiety affect children's report of memory for a stressful event? *Applied Cognitive Psychology, 7*, 109-127.

Vasey, M.W., Elhag, N., & Daleiden, E.L. (1994). *Anxiety and the processing of emotionally-threatening stimuli: Distinctive patterns of selective attention among high- and low-anxious children.* Manuscript submitted for publication.

Vasey, M.W., Daleiden, E.L., Williams, L.L., & Brown, L.M. (1995). Biased attention in childhood anxiety disorders: A preliminary study. *Journal of Abnormal Child Psychology*, 23, 267-279.

Vrana, S.R., Roodman, A. & Beckham, J.C. (in press). Selective processing of trauma-relevant words in posttraumatic stress disorder. *Journal of Anxiety Disorders.*

Warrington, E. (1984). *Recognition Memory Test.* Windsor, Berks: NFER-Nelson.

Watkins, P.C., Mathews, A., Williamson, D.A., & Fuller, R.D. (1992). Mood-congruent memory in depression: emotional priming or elaboration? *Journal of Abnormal Psychology,* 101, 581-586.

Watts, F.N., (1995). Depression and Anxiety. In A.D. Baddeley, B.A. Wilson, and N. Watts (Eds.), *Handbook of Memory Disorders.*, John Wiley & Sons Ltd.

Watts, F.N., McKenna, F.P., Sharrock, R., & Trezise, L. (1986). Colour naming of phobia-related words. *British Journal of Psychology, 77*, 97-108.

Watts, F.N., Morris, L., & MacLeod, A.K. (1987). Recognition memory in depression. *Journal of Abnormal Psychology, 96* , 273-275.

Watts, F.N., & Sharrock, R. (1987). Cued recall in depression. *British Journal of Clinical Psychology,* 26, 149-150.

Whitman, P.B., & Leitenberg, H. (1990). Negatively biased recall in children with self-reported symptoms of depression. *Journal of Abnormal Child Psychology, 18,* 15-27.

Williams, J.M.G., Mathews, A., & Macleod, C. (In press). The emotional Stroop task and psychopathology. *Psychological Bulletin.*

Williams, J.M.G. & Broadbent, K. (1986). Distraction by emotional stimuli: Use of a Stroop task with suicide attempters. *British Journal of Clinical Psychology, 25,* 101-110.

Williams, J.M.G. & Nulty, D.D. (1986). Construct accessibility, depression and the emotional Stroop task: Transient mood or stable structure? *Personality Individual Differences, 7,* 485-491.

Williams, J.M.G., Watts, P.N., Macleod, C., & Mathews, A. (1988). *Cognitive Psychology and Emotional Disorders*. New York: Wiley.

Williams, J.M.G. & Scott, J. (1988). Autobiographical memory in depression. *Psycholoical Medicine, 18,* 689-695.

Wilson, B.A., Ivani-Chalian, R., & Aldrich, F. (1991). *The Rivermead Behavioural*

Memory Test (RBMT). Thames Valley Test Company, UK.

Wilson, B. A. (1991). Long-term prognosis of patients with sever memory disorders. *Neuropsychological Rehabilitation*, 1, 117-134.

Wilson B., CocKburn J., Baddeley A. & Hiorns R. (1989). *Rivermead Behavioural Memory Test (RBMT)*. Thames Valley Test Company, UK.

Wilson B., CocKburn J., Baddeley A. & Hiorns R. (1989), The development and validation of a test battery for detecting and monitoring everyday memory. *Journal of Clinical and Experimental Neuropsychology*, 11, 855-870.

Wolf, J. & Charney D. (1991), Use of neuropsychological assessment in post traumatic stress disorder. *Psychological Assessment*, 3, 573 - 580.

World Health Organization (1989) *International Classification of Diseases*, 10th revision: Draft of Chapter 5: Mental behavioral and developmental disorders: Diagnostic Criteria for Research, Geneva: WHO.

World Health Organization (1992). *The ICD-10 Classification of Mental and Behavioral Disorders: Clinical Descriptions and Diagnostic Guidelines.* Geneva: WHO.

Yager, J. & Gitlin, M. (1995). Clinical manifestation of psychiatric disorder. In H. Kaplan, & B. Sadock (Eds), *Comprehensive Text Book of Psychiatry VI*, Baltimore: Williams & Wilkins.

Yehuda, R., Keefer, R.S.E., Harvey, P.D., Levengood, R.A., Gerber, D. K., Geni, J., & Siever, L.J. (1995). Learning and memory in combat veterans with posttraumatic stress disorder. *American Journal of Psychiatry*, 152, 137-139.

Yule W., (1994), Posttraumatic Stress Disorder; In T.H. Ollendick, N.J. King., & W.

Yule (Eds), *International Handbook of Phobic and Anxiety Disorders in Children and Adolescents,*, New Yourk, Plenum Press.

Yule, W., (1994). Posttraumatic Stress Disordres. In M. Rutter, E. Taylor, & A. Hersov (Eds), *Child and Adolescent Modern Approaches,* Oxford: Blackwell Scientific Publication.

Yule, W., (1992) Posttraumatic stress disorder in child survivors of shipping disasters: The sinking of the "Jupiter." *Psychotherapy and Psychosomatics,* 57, 200-205.

Yule, W., (1992). Resilience and vulnerability in child survivors of disasters. In B. Tizard & V. Varma (Eds.), *Vulunerability and resilience: A Festschrift for Annand Alan Clarke.* London: Jessica Kingsley.

Yule, W., & Gold, A. (1993), *Wise before the event: Coping with crises in schools,* London: Calouste Gulbenkian Foundation.

Yule, W., & Udwin, O., (1991). Screening child survivors for Post-traumatic stress disorders: Experiences from the "Jupiter" sinking. *British Journal of Clinical Psychology,* 30, 131-138.

Yule, W., & Williams R. (1990). Posttraumatic stress reactions in children. *Journal of Traumatic Stress,* 3, 279-295.

Yule, W., Udwin, O. & Murdoch, K. (1990). The 'Jupiter' Sinking: effects on children's fears, depression and anxiety. *Journal of Child Psychology and Psychiatry, 31,* 1051-1061.

Zajonc, R.B. (1980). Feeling and Thinking: Performances need no inferences. *American Psychologist, 35,* 151-175.

Zajonc, R.B.; Pietromonaco, P. & Bargh, J. (1982). Independence and Interaction of Affect and Cognation. In Clark, M.S. & Fisk, S.T. (Ed.). *Affect and Cognition.* USA: Lawrence Erlbaum Associates.

Zeitlin S., & McNally R. (1991). Implicit and explicit memory bias for threat in Post-Traumatic Stress Disorder. *Behaviour, Research and Therapy, 29,* 451-457.

Zilberg NJ, Weiss DS, Horowitz MJ: Impact of Event Scale: A cross-validation study and some empirical evidence supporting a conceptual model of stress response syndromes. *Journal of Clinical Psychology* 50:407-414.

APPENDICES

APPENDIX 4.1

Questionnaire

1- We would like you to write down as many words that come into your mind.

3- Now, we would like you to list as many things as possible that make you happy.

2- If you see a child who is scared or afraid, which things do you think describe what might have frightened him or her.

4- Think about a child who is sad and then write down as many words as you can to describe this feeling.

5- When you feel very good about yourself, what words do you use to describe that feeling?

6- Imagine a child who is feeling very bad about him or herself. Write down as many words as you can to describe that feeling.

7- Now list as many words as you can that describe happy feelings.

8- If you see a child who is scared or afraid, write down as many words as you can to describe those feelings.

9- Please list as many things as you can that make children feel sad.

10- We would like you to write down as many names of animals (e.g. birds, mammals, amphibians, reptiles, etc) that you know as quickly as you can.

Appendix 4.2

Differences between the two groups on producing words in other categories: semantically related neutral words (animals) [$t(219) = 1.64$, $p = 0.102$], semantically unrelated neutral words [$t(219) = 1.36$, $p = 0.175$], positive self-descriptive adjectives [$t(216) = 0.79$, $p = 0.428$], happy feelings [$t(201) = 0.47$, $p = 0.574$], happy things [$t(219) = 0.58$, $p = 0.564$], and scary feelings [$t(197) = 1.30$, $p = 0.564$].

Appendix 4.3

The differences were not significant in 4 categories: semantically unrelated neutral words [$t(75) = 1.39$, $p < 0.169$]; happy feelings [$t(109) = 0.12$, $p = .904$]; scary feelings [$t(110) = 1.45$, $p = 0.149$]; and sad things [$t(111) = 0.87$, $p = .385$].

Appendix 4.4

The number of words produced by the three groups in the 4 categories: semantically related neutral words (animals) [$F(2, 220) = 2.513$, $p = 0.083$]; positive self-descriptive adjectives [$F(2, 220) = 2.504$, $p = 0.084$]; happy feelings [$F(2, 220) = 0.966$, $p < 0.382$]; and happy things [$F(2, 220) = 2.394$, $p < 0.093$].

Appedix 4.5

The differences were not significant in two categories: happy feelings [$t(219) = 1.09$, $p = 0.276$] and scary feelings [$t(219) = 1.74$, $p = 0.083$].

Appendix 4.6: The 25 most frequently generated words in the following categories: scary; sad; happy; and neutral.

WORD COUNT Happy thing

School		Primary			Secondary			Total		
Sex		Girls	Boys	Tot	Girls	Boys	Tot	Girls	Boys	Tot
Number		62	47	109	68	44	112	130	91	221
Friend		34	19	53	47	15	62	81	34	115
	%	54.8	40.4	48.6	69.1	34.1	55.4	62.3	37.4	52
Holiday		21	8	29	30	14	44	51	22	73
	%	33.9	17	26.6	44.1	31.8	39.3	39.2	24.2	33
Play		24	24	48	8	6	14	32	30	62
	%	38.7	51.1	44	11.8	13.6	12.5	24.6	33	28.1
Food		11	10	21	22	8	30	33	18	51
	%	17.7	21.3	19.3	32.4	18.2	26.8	25.4	19.8	23.1
Christmas		22	13	35	11	2	13	33	15	48
	%	35.5	27.7	32.1	16.2	4.5	11.6	25.4	16.5	21.7
Birthday		27	13	40	4	1	5	31	14	45
	%	43.5	27.7	36.7	5.9	2.3	4.5	23.8	15.4	20.4
T.v.		16	13	29	8	7	15	24	20	44
	%	25.8	27.7	26.6	11.8	15.9	13.4	18.5	22	19.9
Family		12	8	20	20	3	23	32	11	43
	%	19.4	17	18.3	29.4	6.8	20.5	24.6	12.1	19.5
Music		3	4	7	24	9	33	27	13	40
	%	4.8	8.5	6.4	35.3	20.5	29.5	20.8	14.3	18.1
Football		7	13	20	5	15	20	12	28	40
	%	11.3	27.7	18.3	7.4	34.1	17.9	9.2	30.8	18.1
Swimming		15	7	22	13	2	15	28	9	37
	%	24.2	14.9	20.2	19.1	4.5	13.4	21.5	9.9	16.7
Mum		16	10	26	9	1	10	25	11	36
	%	25.8	21.3	23.9	13.2	2.3	8.9	19.2	12.1	16.3
Money		9	4	13	13	10	23	22	14	36
	%	14.5	8.5	11.9	19.1	22.7	20.5	16.9	15.4	16.3
Win		13	7	20	2	13	15	15	20	35
	%	21	14.9	18.3	2.9	29.5	13.4	11.5	22	15.8
Love		10	4	14	15	5	20	25	9	34
	%	16.1	8.5	12.8	22.1	11.4	17.9	19.2	9.9	15.4
Sweet		14	7	21	8	1	9	22	8	30
	%	22.6	14.9	19.3	11.8	2.3	8	16.9	8.8	13.6

Laughing		2	6	8	17	5	22	19	11	30
	%	3.2	12.8	7.3	25	11.4	19.6	14.6	12.1	13.6
Dad		13	6	19	7	2	9	20	8	28
	%	21	12.8	17.4	10.3	4.5	8	15.4	8.8	12.7
Presents		10	10	20	4	4	8	14	14	28
	%	16.1	21.3	18.3	5.9	9.1	7.1	10.8	15.4	12.7
Party		15	7	22	3	0	3	18	7	25
	%	24.2	14.9	20.2	4.4	0	2.7	13.8	7.7	11.3
Sun		1	2	3	20	1	21	21	3	24
	%	1.6	4.3	2.8	29.4	2.3	18.8	16.2	3.3	10.9
Animal		7	2	9	14	1	15	21	3	24
	%	11.3	4.3	8.3	20.6	2.3	13.4	16.2	3.3	10.9
Shopping		2	4	6	17	1	18	19	5	24
	%	3.2	8.5	5.5	25	2.3	16.1	14.6	5.5	10.9
Draw		10	6	16	6	1	7	16	7	23
	%	16.1	12.8	14.7	8.8	2.3	6.2	12.3	7.7	10.4
School		14	4	18	2	3	5	16	7	23
	%	22.6	8.5	16.5	2.9	6.8	4.5	12.3	7.7	10.4

WORD COUNT Happy feeling

	School	Primary			Secondary			Total		
	Sex	Girls	Boys	Tot	Girls	Boys	Tot	Girls	Boys	Tot
	Number	62	47	109	68	44	112	130	91	221
Joy		33	25	58	25	20	45	58	45	103
	%	53.2	53.2	53.2	36.8	45.5	40.2	44.6	49.5	46.6
Happy		42	24	66	12	16	28	54	40	94
	%	67.7	51.1	60.6	17.6	36.4	25	41.5	44	42.5
Good		27	20	47	10	10	20	37	30	67
	%	43.5	42.6	43.1	14.7	22.7	17.9	28.5	33	30.3
Love		21	11	32	24	11	35	45	22	67
	%	33.9	23.4	29.4	35.3	25	31.2	34.6	24.2	30.3
Nice		18	22	40	5	1	6	23	23	46
	%	29	46.8	36.7	7.4	2.3	5.4	17.7	25.3	20.8
Excited		10	5	15	13	15	28	23	20	43
	%	16.1	10.6	13.8	19.1	34.1	25	17.7	22	19.5
Great		16	11	27	10	3	13	26	14	40
	%	25.8	23.4	24.8	14.7	6.8	11.6	20	15.4	18.1
Fun		13	11	24	6	9	15	19	20	39
	%	21	23.4	22	8.8	20.5	13.4	14.6	22	17.6
Laughing		12	7	19	10	9	19	22	16	38
	%	19.4	14.9	17.4	14.7	20.5	17	16.9	17.6	17.2
Glad		16	8	24	3	7	10	19	15	34

	%	25.8	17	22	4.4	15.9	8.9	14.6	16.5	15.4
Brilliant		11	9	20	8	3	11	19	12	31
	%	17.7	19.1	18.3	11.8	6.8	9.8	14.6	13.2	14
Wonderful		12	7	19	8	4	12	20	11	31
	%	19.4	14.9	17.4	11.8	9.1	10.7	15.4	12.1	14
Smile		10	7	17	7	4	11	17	11	28
	%	16.1	14.9	15.6	10.3	9.1	9.8	13.1	12.1	12.7
Friend		12	8	20	6	1	7	18	9	27
	%	19.4	17	18.3	8.8	2.3	6.2	13.8	9.9	12.2
Play		12	9	21	2	2	4	14	11	25
	%	19.4	19.1	19.3	2.9	4.5	3.6	10.8	12.1	11.3
Help		9	13	22	0	1	1	9	14	23
	%	14.5	27.7	20.2	0	2.3	.9	6.9	15.4	10.4
Pleased		6	7	13	4	6	10	10	13	23
	%	9.7	14.9	11.9	5.9	13.6	8.9	7.7	14.3	10.4
Friendly		10	8	18	4	0	4	14	8	22
	%	16.1	17	16.5	5.9	0	3.6	10.8	8.8	10
Enjoy		7	2	9	5	6	11	12	8	20
	%	11.3	4.3	8.3	7.4	13.6	9.8	9.2	8.8	9
Kind		11	7	18	0	0	0	11	7	18
	%	17.7	14.9	16.5	0	0	0	8.5	7.7	8.1
Excellent		6	3	9	2	4	6	8	7	15
	%	9.7	6.4	8.3	2.9	9.1	5.4	6.2	7.7	6.8
Jolly		8	0	8	4	2	6	12	2	14
	%	12.9	0	7.3	5.9	4.5	5.4	9.2	2.2	6.3
Christmas		5	4	9	0	4	4	5	8	13
	%	8.1	8.5	8.3	0	9.1	3.6	3.8	8.8	5.9
Cheerful		2	3	5	2	5	7	4	8	12
	%	3.2	6.4	4.6	2.9	11.4	6.2	3.1	8.8	5.4
Content		1	0	1	5	5	10	6	5	11
	%	1.6	0	.9	7.4	11.4	8.9	4.6	5.5	5

WORD COUNT Scary thing

	School	Primary			Secondary			Total		
	Sex	Girls	Boys	Tot	Girls	Boys	Tot	Girls	Boys	Tot
	Children	62	47	109	68	44	112	130	91	221
Dark		15	12	27	32	10	42	47	22	69
	%	24.2	25.5	24.8	47.1	22.7	37.5	36.2	24.2	31.2
Dog		25	12	37	17	10	27	42	22	64
	%	40.3	25.5	33.9	25	22.7	24.1	32.3	24.2	29
Die		9	7	16	26	17	43	35	24	59
	%	14.5	14.9	14.7	38.2	38.6	38.4	26.9	26.4	26.7
Bully		17	9	26	20	13	33	37	22	59
	%	27.4	19.1	23.9	29.4	29.5	29.5	28.5	24.2	26.7
Ghost		13	14	27	22	2	24	35	16	51

	%	21	29.8	24.8	32.4	4.5	21.4	26.9	17.6	23.1
Fire		8	8	16	19	3	22	27	11	38
	%	12.9	17	14.7	27.9	6.8	19.6	20.8	12.1	17.2
Spider		9	8	17	14	5	19	23	13	36
	%	14.5	17	15.6	20.6	11.4	17	17.7	14.3	16.3
Monster		4	5	9	19	5	24	23	10	33
	%	6.5	10.6	8.3	27.9	11.4	21.4	17.7	11	14.9
Lost		5	6	11	11	8	19	16	14	30
	%	8.1	12.8	10.1	16.2	18.2	17	12.3	15.4	13.6
Animal		7	2	9	11	6	17	18	8	26
	%	11.3	4.3	8.3	16.2	13.6	15.2	13.8	8.8	11.8
Film		5	6	11	9	4	13	14	10	24
	%	8.1	12.8	10.1	13.2	9.1	11.6	10.8	11	10.9
Accident		4	4	8	10	6	16	14	10	24
	%	6.5	8.5	7.3	14.7	13.6	14.3	10.8	11	10.9
Noise		8	2	10	10	3	13	18	5	23
	%	12.9	4.3	9.2	14.7	6.8	11.6	13.8	5.5	10.4
Stranger		4	2	6	14	3	17	18	5	23
	%	6.5	4.3	5.5	20.6	6.8	15.2	13.8	5.5	10.4
Alone		3	3	6	12	4	16	15	7	22
	%	4.8	6.4	5.5	17.6	9.1	14.3	11.5	7.7	10
Fight		3	6	9	8	4	12	11	10	21
	%	4.8	12.8	8.3	11.8	9.1	10.7	8.5	11	9.5
Hurt		6	1	7	9	4	13	15	5	20
	%	9.7	2.1	6.4	13.2	9.1	11.6	11.5	5.5	9
People		8	4	12	4	4	8	12	8	20
	%	12.9	8.5	11	5.9	9.1	7.1	9.2	8.8	9
Car		5	5	10	7	2	9	12	7	19
	%	8.1	10.6	9.2	10.3	4.5	8	9.2	7.7	8.6
Man		8	5	13	4	1	5	12	6	18
	%	12.9	10.6	11.9	5.9	2.3	4.5	9.2	6.6	8.1
Teacher		6	3	9	8	1	9	14	4	18
	%	9.7	6.4	8.3	11.8	2.3	8	10.8	4.4	8.1
Cat		11	3	14	2	1	3	13	4	17
	%	17.7	6.4	12.8	2.9	2.3	2.7	10	4.4	7.7
School		2	4	6	9	2	11	11	6	17
	%	3.2	8.5	5.5	13.2	4.5	9.8	8.5	6.6	7.7
Nightmare		3	2	5	7	5	12	10	7	17
	%	4.8	4.3	4.6	10.3	11.4	10.7	7.7	7.7	7.7
Dad		6	4	10	5	1	6	11	5	16
	%	9.7	8.5	9.2	7.4	2.3	5.4	8.5	5.5	7.2

WORD COUNT	Scary feeling									
	School	Primary			Secondary			Total		
	Sex	Girls	Boys	Tot	Girls	Boys	Tot	Girls	Boys	Tot
	Number	62	47	109	68	44	112	130	91	221
Scared		41	25	66	15	8	23	56	33	89
	%	66.1	53.2	60.6	22.1	18.2	20.5	43.1	36.3	40.3
Frighten		30	20	50	16	14	30	46	34	80
	%	48.4	42.6	45.9	23.5	31.8	26.8	35.4	37.4	36.2
Sad		33	23	56	12	11	23	45	34	79
	%	53.2	48.9	51.4	17.6	25	20.5	34.6	37.4	35.7
Afraid		29	21	50	9	8	17	38	29	67
	%	46.8	44.7	45.9	13.2	18.2	15.2	29.2	31.9	30.3
Unhappy		23	10	33	13	10	23	36	20	56
	%	37.1	21.3	30.3	19.1	22.7	20.5	27.7	22	25.3
Upset		21	13	34	4	5	9	25	18	43
	%	33.9	27.7	31.2	5.9	11.4	8	19.2	19.8	19.5
Lonely		19	7	26	12	5	17	31	12	43
	%	30.6	14.9	23.9	17.6	11.4	15.2	23.8	13.2	19.5
Worry		11	8	19	10	8	18	21	16	37
	%	17.7	17	17.4	14.7	18.2	16.1	16.2	17.6	16.7
Alone		1	4	5	22	8	30	23	12	35
	%	1.6	8.5	4.6	32.4	18.2	26.8	17.7	13.2	15.8
Cold		7	6	13	7	5	12	14	11	25
	%	11.3	12.8	11.9	10.3	11.4	10.7	10.8	12.1	11.3
Horrible		12	8	20	4	1	5	16	9	25
	%	19.4	17	18.3	5.9	2.3	4.5	12.3	9.9	11.3
Hurt		7	6	13	5	6	11	12	12	24
	%	11.3	12.8	11.9	7.4	13.6	9.8	9.2	13.2	10.9
Lost		8	4	12	9	3	12	17	7	24
	%	12.9	8.5	11	13.2	6.8	10.7	13.1	7.7	10.9
Angry		7	5	12	4	7	11	11	12	23
	%	11.3	10.6	11	5.9	15.9	9.8	8.5	13.2	10.4
Terrified		8	4	12	7	4	11	15	8	23
	%	12.9	8.5	11	10.3	9.1	9.8	11.5	8.8	10.4
Nervous		3	3	6	7	5	12	10	8	18
	%	4.8	6.4	5.5	10.3	11.4	10.7	7.7	8.8	8.1
Petrify		7	2	9	3	3	6	10	5	15
	%	11.3	4.3	8.3	4.4	6.8	5.4	7.7	5.5	6.8
Cry		4	5	9	1	4	5	5	9	14
	%	6.5	10.6	8.3	1.5	9.1	4.5	3.8	9.9	6.3
Confused		3	2	5	8	1	9	11	3	14
	%	4.8	4.3	4.6	11.8	2.3	8	8.5	3.3	6.3
Dark		1	1	2	9	1	10	10	2	12
	%	1.6	2.1	1.8	13.2	2.3	8.9	7.7	2.2	5.4
Unloved		4	2	6	5	1	6	9	3	12

	%	6.5	4.3	5.5	7.4	2.3	5.4	6.9	3.3	5.4
Anxious		0	0	0	7	2	9	7	2	9
	%	0	0	0	10.3	4.5	8	5.4	2.2	4.1
Shaking		2	4	6	2	1	3	4	5	9
	%	3.2	8.5	5.5	2.9	2.3	2.7	3.1	5.5	4.1
Shocked		3	1	4	2	3	5	5	4	9
	%	4.8	2.1	3.7	2.9	6.8	4.5	3.8	4.4	4.1
Unwanted		3	0	3	6	0	6	9	0	9
	%	4.8	0	2.8	8.8	0	5.4	6.9	0	4.1

WORD COUNT	Positive self-descriptive adjectives									
	School	Primary			Secondary			Total		
	Sex	Girls	Boys	Tot	Girls	Boys	Tot	Girls	Boys	Tot
	Number	62	47	109	68	44	112	130	91	221
Happy		52	39	91	57	34	91	109	73	182
	%	83.9	83	83.5	83.8	77.3	81.2	83.8	80.2	82.4
Good		44	34	78	9	14	23	53	48	101
	%	71	72.3	71.6	13.2	31.8	20.5	40.8	52.7	45.7
Joy		20	18	38	21	12	33	41	30	71
	%	32.3	38.3	34.9	30.9	27.3	29.5	31.5	33	32.1
Proud		18	6	24	31	10	41	49	16	65
	%	29	12.8	22	45.6	22.7	36.6	37.7	17.6	29.4
Brilliant		21	18	39	14	11	25	35	29	64
	%	33.9	38.3	35.8	20.6	25	22.3	26.9	31.9	29
Great		23	13	36	13	6	19	36	19	55
	%	37.1	27.7	33	19.1	13.6	17	27.7	20.9	24.9
Nice		21	19	40	5	2	7	26	21	47
	%	33.9	40.4	36.7	7.4	4.5	6.2	20	23.1	21.3
Excited		15	7	22	17	8	25	32	15	47
	%	24.2	14.9	20.2	25	18.2	22.3	24.6	16.5	21.3
Pleased		18	6	24	14	8	22	32	14	46
	%	29	12.8	22	20.6	18.2	19.6	24.6	15.4	20.8
Glad		16	9	25	5	6	11	21	15	36
	%	25.8	19.1	22.9	7.4	13.6	9.8	16.2	16.5	16.3
Excellent		8	12	20	10	6	16	18	18	36
	%	12.9	25.5	18.3	14.7	13.6	14.3	13.8	19.8	16.3
Wonderful		12	7	19	12	2	14	24	9	33
	%	19.4	14.9	17.4	17.6	4.5	12.5	18.5	9.9	14.9
Love		9	3	12	16	4	20	25	7	32
	%	14.5	6.4	11	23.5	9.1	17.9	19.2	7.7	14.5
Fun		9	3	12	9	0	9	18	3	21
	%	14.5	6.4	11	13.2	0	8	13.8	3.3	9.5
Friendly		8	5	13	6	0	6	14	5	19
	%	12.9	10.6	11.9	8.8	0	5.4	10.8	5.5	8.6

Help		9	7	16	1	1	2	10	8	18
	%	14.5	14.9	14.7	1.5	2.3	1.8	7.7	8.8	8.1
Confident		1	1	2	12	4	16	13	5	18
	%	1.6	2.1	1.8	17.6	9.1	14.3	10	5.5	8.1
Fantastic		4	3	7	10	1	11	14	4	18
	%	6.5	6.4	6.4	14.7	2.3	9.8	10.8	4.4	8.1
Cool		0	1	1	11	2	13	11	3	14
	%	0	2.1	.9	16.2	4.5	11.6	8.5	3.3	6.3
Wicked		4	4	8	4	2	6	8	6	14
	%	6.5	8.5	7.3	5.9	4.5	5.4	6.2	6.6	6.3
Best		4	3	7	4	2	6	8	5	13
	%	6.5	6.4	6.4	5.9	4.5	5.4	6.2	5.5	5.9
Content		0	0	0	6	7	13	6	7	13
	%	0	0	0	8.8	15.9	11.6	4.6	7.7	5.9
Free		5	1	6	6	0	6	11	1	12
	%	8.1	2.1	5.5	8.8	0	5.4	8.5	1.1	5.4
Play		7	5	12	0	0	0	7	5	12
	%	11.3	10.6	11	0	0	0	5.4	5.5	5.4
Kind		5	2	7	3	1	4	8	3	11
	%	8.1	4.3	6.4	4.4	2.3	3.6	6.2	3.3	5

WORD COUNT Negative self-descriptive adjectives

	School	Primary			Secondary			Total		
	Sex	Girls	Boys	Tot	Girls	Boys	Tot	Girls	Boys	Tot
	Number	62	47	109	68	44	112	130	91	221
Sad		40	21	61	20	24	44	60	45	105
	%	64.5	44.7	56	29.4	54.5	39.3	46.2	49.5	47.5
Unhappy		24	15	39	13	19	32	37	34	71
	%	38.7	31.9	35.8	19.1	43.2	28.6	28.5	37.4	32.1
Bad		24	28	52	6	7	13	30	35	65
	%	38.7	59.6	47.7	8.8	15.9	11.6	23.1	38.5	29.4
Angry		21	11	32	13	8	21	34	19	53
	%	33.9	23.4	29.4	19.1	18.2	18.8	26.2	20.9	24
Guilty		9	3	12	24	11	35	33	14	47
	%	14.5	6.4	11	35.3	25	31.2	25.4	15.4	21.3
Upset		14	3	17	10	7	17	24	10	34
	%	22.6	6.4	15.6	14.7	15.9	15.2	18.5	11	15.4
Stupid		7	6	13	12	8	20	19	14	33
	%	11.3	12.8	11.9	17.6	18.2	17.9	14.6	15.4	14.9
Horrible		15	10	25	5	3	8	20	13	33
	%	24.2	21.3	22.9	7.4	6.8	7.1	15.4	14.3	14.9
Sorry		7	6	13	5	7	12	12	13	25
	%	11.3	12.8	11.9	7.4	15.9	10.7	9.2	14.3	11.3
Depressed		2	0	2	14	9	23	16	9	25
	%	3.2	0	1.8	20.6	20.5	20.5	12.3	9.9	11.3

Worry		9	1	10	9	5	14	18	6	24
	%	14.5	2.1	9.2	13.2	11.4	12.5	13.8	6.6	10.9
Mad		12	10	22	1	0	1	13	10	23
	%	19.4	21.3	20.2	1.5	0	.9	10	11	10.4
Naughty		11	10	21	1	1	2	12	11	23
	%	17.7	21.3	19.3	1.5	2.3	1.8	9.2	12.1	10.4
Ashamed		5	6	11	6	4	10	11	10	21
	%	8.1	12.8	10.1	8.8	9.1	8.9	8.5	11	9.5
Terrible		9	5	14	5	2	7	14	7	21
	%	14.5	10.6	12.8	7.4	4.5	6.2	10.8	7.7	9.5
Scared		5	6	11	9	0	9	14	6	20
	%	8.1	12.8	10.1	13.2	0	8	10.8	6.6	9
Alone		0	2	2	14	3	17	14	5	19
	%	0	4.3	1.8	20.6	6.8	15.2	10.8	5.5	8.6
Hate		6	3	9	6	3	9	12	6	18
	%	9.7	6.4	8.3	8.8	6.8	8	9.2	6.6	8.1
Lost		5	3	8	6	4	10	11	7	18
	%	8.1	6.4	7.3	8.8	9.1	8.9	8.5	7.7	8.1
Nasty		6	7	13	2	2	4	8	9	17
	%	9.7	14.9	11.9	2.9	4.5	3.6	6.2	9.9	7.7
Lonely		1	2	3	7	7	14	8	9	17
	%	1.6	4.3	2.8	10.3	15.9	12.5	6.2	9.9	7.7
Unwanted		1	0	1	14	1	15	15	1	16
	%	1.6	0	.9	20.6	2.3	13.4	11.5	1.1	7.2
Silly		7	5	12	3	0	3	10	5	15
	%	11.3	10.6	11	4.4	0	2.7	7.7	5.5	6.8
Annoyed		5	4	9	3	3	6	8	7	15
	%	8.1	8.5	8.3	4.4	6.8	5.4	6.2	7.7	6.8
Unloved		4	1	5	7	3	10	11	4	15
	%	6.5	2.1	4.6	10.3	6.8	8.9	8.5	4.4	6.8

WORD COUNT Sad thing

	School	Primary			Secondary			Total		
	Sex	Girls	Boys	Tot	Girls	Boys	Tot	Girls	Boys	Tot
	Number	61	47	108	69	44	113	130	91	221
Die		22	14	36	30	18	48	52	32	84
	%	36.1	29.8	33.3	43.5	40.9	42.5	40	35.2	38
Bully		15	9	24	16	15	31	31	24	55
	%	24.6	19.1	22.2	23.2	34.1	27.4	23.8	26.4	24.9
Lost		8	5	13	7	14	21	15	19	34
	%	13.1	10.6	12	10.1	31.8	18.6	11.5	20.9	15.4
Told off		11	6	17	6	7	13	17	13	30
	%	18	12.8	15.7	8.7	15.9	11.5	13.1	14.3	13.6
Fight		6	8	14	5	9	14	11	17	28

	%	9.8	17	13	7.2	20.5	12.4	8.5	18.7	12.7
Hurt		8	3	11	9	7	16	17	10	27
	%	13.1	6.4	10.2	13	15.9	14.2	13.1	11	12.2
Lonely		8	2	10	8	7	15	16	9	25
	%	13.1	4.3	9.3	11.6	15.9	13.3	12.3	9.9	11.3
Ill		7	4	11	6	7	13	13	11	24
	%	11.5	8.5	10.2	8.7	15.9	11.5	10	12.1	10.9
Names		14	8	22	1	0	1	15	8	23
	%	23	17	20.4	1.4	0	.9	11.5	8.8	10.4
Pain		0	0	0	13	8	21	13	8	21
	%	0	0	0	18.8	18.2	18.6	10	8.8	9.5
Shout		5	7	12	6	2	8	11	9	20
	%	8.2	14.9	11.1	8.7	4.5	7.1	8.5	9.9	9
Friendless		9	1	10	7	3	10	16	4	20
	%	14.8	2.1	9.3	10.1	6.8	8.8	12.3	4.4	9
Hit		9	5	14	3	1	4	12	6	18
	%	14.8	10.6	13	4.3	2.3	3.5	9.2	6.6	8.1
Kick		10	7	17	1	0	1	11	7	18
	%	16.4	14.9	15.7	1.4	0	.9	8.5	7.7	8.1
War		5	3	8	6	3	9	11	6	17
	%	8.2	6.4	7.4	8.7	6.8	8	8.5	6.6	7.7
Divorce		0	0	0	14	2	16	14	2	16
	%	0	0	0	20.3	4.5	14.2	10.8	2.2	7.2
Argument		4	5	9	5	1	6	9	6	15
	%	6.6	10.6	8.3	7.2	2.3	5.3	6.9	6.6	6.8
School		1	0	1	7	6	13	8	6	14
	%	1.6	0	.9	10.1	13.6	11.5	6.2	6.6	6.3
Rejection		0	0	0	13	1	14	13	1	14
	%	0	0	0	18.8	2.3	12.4	10	1.1	6.3
Sad		5	3	8	3	2	5	8	5	13
	%	8.2	6.4	7.4	4.3	4.5	4.4	6.2	5.5	5.9
Alone		3	1	4	8	1	9	11	2	13
	%	4.9	2.1	3.7	11.6	2.3	8	8.5	2.2	5.9
Unhappy		5	5	10	2	1	3	7	6	13
	%	8.2	10.6	9.3	2.9	2.3	2.7	5.4	6.6	5.9
Hate		3	4	7	2	2	4	5	6	11
	%	4.9	8.5	6.5	2.9	4.5	3.5	3.8	6.6	5
Punch		6	4	10	1	0	1	7	4	11
	%	9.8	8.5	9.3	1.4	0	.9	5.4	4.4	5
Loneliness		0	0	0	11	0	11	11	0	11
	%	0	0	0	15.9	0	9.7	8.5	0	5

WORD COUNT Sad feeling									
School	Primary			Secondary			Total		
Sex	Girls	Boys	Tot	Girls	Boys	Tot	Girls	Boys	Tot

	Number	62	47	109	68	44	112	130	91	221
Unhappy		26	22	48	24	22	46	50	44	94
	%	41.9	46.8	44	35.3	50	41.1	38.5	48.4	42.5
Lonely		31	12	43	28	8	36	59	20	79
	%	50	25.5	39.4	41.2	18.2	32.1	45.4	22	35.7
Sad		27	21	48	15	10	25	42	31	73
	%	43.5	44.7	44	22.1	22.7	22.3	32.3	34.1	33
Upset		20	16	36	15	10	25	35	26	61
	%	32.3	34	33	22.1	22.7	22.3	26.9	28.6	27.6
Angry		19	14	33	14	7	21	33	21	54
	%	30.6	29.8	30.3	20.6	15.9	18.8	25.4	23.1	24.4
Scared		17	11	28	17	5	22	34	16	50
	%	27.4	23.4	25.7	25	11.4	19.6	26.2	17.6	22.6
Lost		8	7	15	18	6	24	26	13	39
	%	12.9	14.9	13.8	26.5	13.6	21.4	20	14.3	17.6
Alone		4	8	12	20	6	26	24	14	38
	%	6.5	17	11	29.4	13.6	23.2	18.5	15.4	17.2
Hurt		10	7	17	14	5	19	24	12	36
	%	16.1	14.9	15.6	20.6	11.4	17	18.5	13.2	16.3
Frighten		13	9	22	11	1	12	24	10	34
	%	21	19.1	20.2	16.2	2.3	10.7	18.5	11	15.4
Miserable		11	7	18	12	4	16	23	11	34
	%	17.7	14.9	16.5	17.6	9.1	14.3	17.7	12.1	15.4
Worry		4	3	7	15	6	21	19	9	28
	%	6.5	6.4	6.4	22.1	13.6	18.8	14.6	9.9	12.7
Afraid		6	7	13	12	3	15	18	10	28
	%	9.7	14.9	11.9	17.6	6.8	13.4	13.8	11	12.7
Depressed		0	0	0	16	7	23	16	7	23
	%	0	0	0	23.5	15.9	20.5	12.3	7.7	10.4
Bad		5	6	11	6	5	11	11	11	22
	%	8.1	12.8	10.1	8.8	11.4	9.8	8.5	12.1	10
Cry		5	10	15	4	1	5	9	11	20
	%	8.1	21.3	13.8	5.9	2.3	4.5	6.9	12.1	9
Die		5	3	8	8	4	12	13	7	20
	%	8.1	6.4	7.3	11.8	9.1	10.7	10	7.7	9
Horrible		10	5	15	4	0	4	14	5	19
	%	16.1	10.6	13.8	5.9	0	3.6	10.8	5.5	8.6
Hate		2	6	8	6	2	8	8	8	16
	%	3.2	12.8	7.3	8.8	4.5	7.1	6.2	8.8	7.2
Unwanted		2	4	6	8	2	10	10	6	16
	%	3.2	8.5	5.5	11.8	4.5	8.9	7.7	6.6	7.2
Disappointed		1	3	4	8	4	12	9	7	16
	%	1.6	6.4	3.7	11.8	9.1	10.7	6.9	7.7	7.2
Cold		3	5	8	4	3	7	7	8	15
	%	4.8	10.6	7.3	5.9	6.8	6.2	5.4	8.8	6.8
Pain		1	2	3	11	1	12	12	3	15
	%	1.6	4.3	2.8	16.2	2.3	10.7	9.2	3.3	6.8
Friendless		7	3	10	3	2	5	10	5	15
	%	11.3	6.4	9.2	4.4	4.5	4.5	7.7	5.5	6.8

Down	2	1	3	6	4	10	8	5	13
%	3.2	2.1	2.8	8.8	9.1	8.9	6.2	5.5	5.9

WORD COUNT Categorised Neutral (Animal)

School	Primary			Secondary			Total		
Sex	Girls	Boys	Tot	Girls	Boys	Tot	Girls	Boys	Tot
Number	62	47	109	68	44	112	130	91	221
Dog	56	36	92	56	36	92	112	72	184
%	90.3	76.6	84.4	82.4	81.8	82.1	86.2	79.1	83.3
Cat	56	34	90	55	34	89	111	68	179
%	90.3	72.3	82.6	80.9	77.3	79.5	85.4	74.7	81
Lion	38	30	68	33	26	59	71	56	127
%	61.3	63.8	62.4	48.5	59.1	52.7	54.6	61.5	57.5
Tiger	37	29	66	35	25	60	72	54	126
%	59.7	61.7	60.6	51.5	56.8	53.6	55.4	59.3	57
Elephant	34	23	57	42	22	64	76	45	121
%	54.8	48.9	52.3	61.8	50	57.1	58.5	49.5	54.8
Fish	38	24	62	30	17	47	68	41	109
%	61.3	51.1	56.9	44.1	38.6	42	52.3	45.1	49.3
Horse	25	8	33	32	17	49	57	25	82
%	40.3	17	30.3	47.1	38.6	43.8	43.8	27.5	37.1
Snake	25	16	41	22	19	41	47	35	82
%	40.3	34	37.6	32.4	43.2	36.6	36.2	38.5	37.1
Pig	24	16	40	28	9	37	52	25	77
%	38.7	34	36.7	41.2	20.5	33	40	27.5	34.8
Cow	19	11	30	29	17	46	48	28	76
%	30.6	23.4	27.5	42.6	38.6	41.1	36.9	30.8	34.4
Rabbit	24	10	34	31	10	41	55	20	75
%	38.7	21.3	31.2	45.6	22.7	36.6	42.3	22	33.9
Monkey	23	17	40	21	13	34	44	30	74
%	37.1	36.2	36.7	30.9	29.5	30.4	33.8	33	33.5
Mouse	16	10	26	21	19	40	37	29	66
%	25.8	21.3	23.9	30.9	43.2	35.7	28.5	31.9	29.9
Frog	17	16	33	18	12	30	35	28	63
%	27.4	34	30.3	26.5	27.3	26.8	26.9	30.8	28.5
Bird	19	20	39	13	10	23	32	30	62
%	30.6	42.6	35.8	19.1	22.7	20.5	24.6	33	28.1
Whale	16	13	29	16	13	29	32	26	58
%	25.8	27.7	26.6	23.5	29.5	25.9	24.6	28.6	26.2
Crocodile	21	15	36	14	6	20	35	21	56
%	33.9	31.9	33	20.6	13.6	17.9	26.9	23.1	25.3
Sheep	12	7	19	17	18	35	29	25	54
%	19.4	14.9	17.4	25	40.9	31.2	22.3	27.5	24.4
Eagle	19	14	33	12	6	18	31	20	51
%	30.6	29.8	30.3	17.6	13.6	16.1	23.8	22	23.1

Bear		14	5	19	21	10	31	35	15	50
	%	22.6	10.6	17.4	30.9	22.7	27.7	26.9	16.5	22.6
Shark		12	17	29	9	9	18	21	26	47
	%	19.4	36.2	26.6	13.2	20.5	16.1	16.2	28.6	21.3
Spider		11	10	21	14	9	23	25	19	44
	%	17.7	21.3	19.3	20.6	20.5	20.5	19.2	20.9	19.9
Dolphin		13	9	22	14	7	21	27	16	43
	%	21	19.1	20.2	20.6	15.9	18.8	20.8	17.6	19.5
Ant		15	8	23	11	7	18	26	15	41
	%	24.2	17	21.1	16.2	15.9	16.1	20	16.5	18.6
Fox		19	14	33	6	1	7	25	15	40
	%	30.6	29.8	30.3	8.8	2.3	6.2	19.2	16.5	18.1

WORD COUNT Neutral										
	School	Primary			Secondary			Total		
	Sex	Girls	Boys	Tot	Girls	Boys	Tot	Girls	Boys	Tot
	Number	62	47	109	68	44	112	130	91	221
Dog		13	13	26	14	0	14	27	13	40
	%	21	27.7	23.9	20.6	0	12.5	20.8	14.3	18.1
Pen		15	3	18	13	6	19	28	9	37
	%	24.2	6.4	16.5	19.1	13.6	17	21.5	9.9	16.7
School		5	6	11	8	11	19	13	17	30
	%	8.1	12.8	10.1	11.8	25	17	10	18.7	13.6
Football		5	7	12	2	16	18	7	23	30
	%	8.1	14.9	11	2.9	36.4	16.1	5.4	25.3	13.6
Paper		11	7	18	4	7	11	15	14	29
	%	17.7	14.9	16.5	5.9	15.9	9.8	11.5	15.4	13.1
Car		3	10	13	7	8	15	10	18	28
	%	4.8	21.3	11.9	10.3	18.2	13.4	7.7	19.8	12.7
Cat		10	8	18	8	1	9	18	9	27
	%	16.1	17	16.5	11.8	2.3	8	13.8	9.9	12.2
Work		12	7	19	5	3	8	17	10	27
	%	19.4	14.9	17.4	7.4	6.8	7.1	13.1	11	12.2
Maths		9	6	15	7	3	10	16	9	25
	%	14.5	12.8	13.8	10.3	6.8	8.9	12.3	9.9	11.3
Computer		6	5	11	2	11	13	8	16	24
	%	9.7	10.6	10.1	2.9	25	11.6	6.2	17.6	10.9
Book		8	4	12	10	1	11	18	5	23
	%	12.9	8.5	11	14.7	2.3	9.8	13.8	5.5	10.4
Horse		9	2	11	6	6	12	15	8	23
	%	14.5	4.3	10.1	8.8	13.6	10.7	11.5	8.8	10.4
Man		10	4	14	7	1	8	17	5	22
	%	16.1	8.5	12.8	10.3	2.3	7.1	13.1	5.5	10

Food		7	1	8	8	6	14	15	7	22
	%	11.3	2.1	7.3	11.8	13.6	12.5	11.5	7.7	10
T.v.		6	3	9	4	8	12	10	11	21
	%	9.7	6.4	8.3	5.9	18.2	10.7	7.7	12.1	9.5
Table		1	1	2	10	9	19	11	10	21
	%	1.6	2.1	1.8	14.7	20.5	17	8.5	11	9.5
Tree		6	4	10	8	2	10	14	6	20
	%	9.7	8.5	9.2	11.8	4.5	8.9	10.8	6.6	9
People		5	4	9	3	6	9	8	10	18
	%	8.1	8.5	8.3	4.4	13.6	8	6.2	11	8.1
Pencil		9	1	10	5	2	7	14	3	17
	%	14.5	2.1	9.2	7.4	4.5	6.2	10.8	3.3	7.7
Time		2	2	4	6	5	11	8	7	15
	%	3.2	4.3	3.7	8.8	11.4	9.8	6.2	7.7	6.8
Bird		2	4	6	7	1	8	9	5	14
	%	3.2	8.5	5.5	10.3	2.3	7.1	6.9	5.5	6.3
Drink		5	1	6	2	5	7	7	6	13
	%	8.1	2.1	5.5	2.9	11.4	6.2	5.4	6.6	5.9
Hot		2	0	2	6	4	10	8	4	12
	%	3.2	0	1.8	8.8	9.1	8.9	6.2	4.4	5.4
Teacher		3	1	4	5	3	8	8	4	12
	%	4.8	2.1	3.7	7.4	6.8	7.1	6.2	4.4	5.4
Music		0	0	0	3	8	11	3	8	11
	%	0	0	0	4.4	18.2	9.8	2.3	8.8	5

Appendix 4.7

Lists of trauma-related words

(a) Words related to Personal Violence

WORDS / POINTS	0	1	2	3
ACCIDENT	0	3	4	0
VIOLENCE	0	0	3	4
WITNESS	3	3	1	0
BURGLARY	0	2	3	2
TORTURE	0	0	3	4
SMASH	0	3	2	2
ASSAULT	0	0	3	3
TRAPPED	0	1	4	2
ATTACKED	0	1	2	4
HARM	0	1	6	0
AGGRESSION	0	1	5	1
VICTIM	0	2	4	1
AMBULANCE	1	2	3	1
TORTURER	0	0	3	4
KNIFE	1	1	3	2
GUN	1	2	2	2
KILLING	0	2	1	4
STRETCHER	1	5	1	0
SIREN	1	5	1	0
CRIME	1	4	2	0
SERIOUS	4	2	1	0
POLICE	2	2	2	1
DEATH	0	3	1	3
HOSPITAL	1	2	3	1
SHOUT	3	3	1	0
MURDER	0	2	2	3
HOMICIDE	2	1	1	2

Words related to personal violence, continued

WORDS / POINTS	0	1	2	3
BLOOD	0	2	3	2
NIGHTMARE	0	1	4	2
AGGRAVATED	2	2	2	0
ANGRY	1	3	2	1
BROKEN	3	3	1	0
BANDAGE	2	2	3	0
ROBBWRY	1	2	3	1
EMERGENCY	1	4	3	1
I NJURED	1	1	5	0
SCREAM	1	2	3	1
RISK	2	3	1	0
DANGER	0	5	1	1
HURT	0	5	1	1
SHOOTING	0	2	5	1
FIGHT	0	4	2	1
TERROR	0	1	3	

(b) The words related to Road Traffic Accident

WORDS / POINTS	0	1	2	3
ACCIDENT	0	4	2	4
IMPACT	2	3	5	0
CRUSH	0	2	6	2
GLASS	1	2	5	1
WINDSCREEN	3	3	3	0
SMASH	0	2	3	5
SCREECH	0	2	4	2
TRAPPED	0	0	7	3
CASUALTY	o	3	6	1
CRASH	0	2	3	5
TRAFFIC	6	1	3	0
SEATBELT	5	2	2	1
AMBULANCE	1	2	5	2
DRIVING	6	1	2	1
PASSENGER	6	2	2	0
DRIVER	7	0	3	0
FAST	6	1	2	1
STRETCHER	o	4	6	0
SIREN	1	4	3	2
STREET	7	2	1	0
CAR	6	1	2	1
POLICE	1	5	4	0

Words related to the Road Traffic Accidnets, continued

WORDS / POINTS	0	1	2	3
ROAD	6	2	1	1
HOSPITAL	1	4	3	2
SHOUT	3	5	1	1
CROSSING	6	3	1	0
BANG	1	6	2	1
SPEED	2	5	2	0
SCREAM	0	2	5	3
SUDDEN	1	9	0	0
EMERGENCY	1	5	4	1
INJURED	0	4	6	0
BLOOD	0	1	4	6
NIGHTMARE	0	2	3	5
MOTORBIKE	6	3	2	0
SORROW	2	3	5	0
BROKEN	1	4	5	0
COLLISION	0	6	3	1
DANGER	1	2	7	0

Appendix 5.1

Words used in the Stroop Task

	Threat	Sad	Happy	Neutral	PTSD
1	Cold	Lonely	Love	Bird	Glass
2	Dark	helpless	Grateful	Parrot	Police
3	Ghost	Lost	Park	Kangaroo	Crush
4	Horrible	Weak	Kindness	Donkey	Casualty
5	Worried	Crying	Smile	Duck	Danger
6	Kidnapped	Funeral	Joke	Lizard	Bang
7	School	Alone	Easter	Sheep	Injured
8	Terrified	Miserable	Pleased	Sparrow	Bandage
9	Bully	Sick	Rich	Robin	Blood
10	Petrified	Bad	Funfair	Butterfly	Emergency
11	Failed	Friendless	Excited	Zebra	Hospital
12	Bomb	Argument	Brilliant	Gorilla	Siren

Appendix 5.2

Differences between PTSD patients and normal controls on age [$F(1, 44) = 0.8$, $P = 0.376$], verbal IQ [$F(1, 44) = 0.45$, $P = 0.505$], and reading ability [$F(1, 44) = 0.478$, $P = 0.793$].

Appendix 5.3

ANOVAs of colour-naming times for depressed words [$F(1, 23) = 1.83$, $P = 0.189$], happy words [$F(1, 23) = 0.32$, $P = 0.576$], and threat words [$F(1, 23) = 0.00$, $P = 0.988$] relative to neutral words in the PTSD group.

Appendix 5.4

Main effect of Group [$F(1, 44) = 1.43$, $P = 0.239$], and Index Type [$F(1, 44) = 0.65$, P

= 0.582] for differential Index analysis across PTSD patients and controls.

Appendix 5.5

The results of paired sample t-test across all PTSD patients between the indices of happy words and sad words [t (22) = 1.12, P = 0.276], happy words and threat words [t (22) = 0.58, P = 0.566], trauma-related words and depressed words [t (22) = 1.39 P = 0.178], and depressed words and threat words [t (22) = 1.71, P = 0.102].

Appendix 5.6

Differences between RTA and PV groups on verbal IQ [F(1, 22) = 1.24, P = 0.279], reading ability [F(1, 22) = 0.0007, P = 0.979], RCMAS anxiety score [F(1, 22) = 2.20, P = 0.153], total score of IES [F(1, 21) = 0.428, P = 0.520], Intrusion sub-scale of IES [F(1, 22) = 0.031, P = 0.862], and Avoidance sub-scale of IES [F(1, 22) = 0.59, P = 0.451].

Appendix 5.7

Main effect of Group [F(1, 21) = 0.89, P = 0.365], and interaction [F(4, 84) = 1.88, P = 0.121] for colour-naming times across RTA and PV subjects.

Appendix 5.8

Differences between PTSD and control children (under 13 years) on age [F(1, 15) = 2.22, P = 0.158], verbal IQ [F(1, 15) = 1.75, P = 0.206], reading ability [F(1, 15) = 0.52, P = 0.944], and RCMAS anxiety score [F(1, 15) = 0.614, P = 0.446].

Appendix 5.9

The main effects of Group [F(1, 14) = 3.37, P = 0.088], and Word Type [F(4, 56) = 0.82, P = 0.520] for colour-naming times across PTSD and control children (under 13 years).

Appendix 5.10

The results of paired sample t-tests across children control subjects between neutral words and depression-related words [t (5) = 0.91, P = 0.403], neutral and happy words [t (5) = 1.71, P = 0.149], neutral and trauma-related words [t (5) = 1.41, P = 0.219], neutral and threat words [t (5) = 1.63, P = 0.163], between depressed words and happy words [t (5) = 0.09, P = 0.93], depressed words and threat words [t (5) = 0.58, P = 0.589], and between happy and threat words [t (5) = 0.61, P = 0.566].

Appendix 5.11

Differences between PTSD and control adolescents on age [F(1, 29) = 3.80, P = 0.061], verbal IQ [F(1, 29) = 0.275, P = 0.870], and reading ability [F(1, 29) = 0.462, P = 0.502].

Appendix 5.12

The results of paired sample t-tests across adolescents with PTSD between neutral words and depression-related words [t (12) = 1.26, P = 0.233], neutral and happy words [t (12) = 1.56, P = 0.144], neutral and threat words [t (12) = 0.05, P = 0.962], between depressed words and happy words [t (12) = 0.65, P = 0.528], depressed words and trauma-related words [t (12) = 1.18, P = 0.261], depressed words and threat words [t (12) = 1.66, P = 0.123], between happy words and trauma-related words [t (12) = 1.76, P = 0.104], and between happy and threat words [t (12) = 1.29, P = 0.221].

Appendix 5.13

Differences between boys and girls with PTSD on age [F(1, 22) = 0.016, P = 0.900], verbal IQ [F(1, 22) = 0.0327, P = 0.850], DSRS depression score [F(1, 22) = 0.598, P = 0.448], RCMAS anxiety score [F(1, 22) = 2.32, P = 0.143], total scores on the IES = [F(1, 22) = 2.55, P = 0.126], scores on the intrusion sub-scale of IES [F(1, 22) = 1.78, P = 0.198].

Appendix 5.14

The main effect of Group [F(1, 22) = 0.40, P = 0.536], and interaction [F(4, 84) = 0.69, P = 0.601] across boys and girls with PTSD.

Appendix 5.15

The results of paired sample t-tests across all PTSD patients between neutral words and depression-related words [t (22) = 1.35, P = 0.189], neutral and happy words [t (22) = 0.57, P = 0.576], neutral and threat words [t (22) = 0.02, P = 0.988], between depressed words and happy words [t (22) = 1.12, P = 0.276], depressed words and trauma-related words [t (22) = 1.39, P = 0.178], depressed words and threat words [t (22) = 1.71, P = 0.102], and between happy and threat words [t (22) = 0.56, P = 0.566].

Appendix 5.16

Differences between children of adults with PTSD and controls on age [F(1, 40) = 0.72, P = 0.40], verbal IQ [F(1, 40) = 1.08, P = 0.05], reading ability [F(1, 40) = 0.46, P = 0.86], and RCMAS anxiety score [F(1, 43) = 1.51, P = 0.227].

Appendix 5.17

ANOVAs comparing RTs to colour-name neutral words and happy words [F(1, 17) = .93, P = 0.349], and depressed words [F(1, 17) = 2.65, P = 0.122] across children of adults with PTSD.

Appendix 5.18

Differences between children of adult with PTSD and controls (under 113 years) on age [F(1, 14) = 0.61, P = 0.449], verbal IQ [F(1, 14) = 0.739, P = 0.405], reading ability [F(1, 14) = 0.009, P = 0.926], RCMAS anxiety scores [F(1, 14) = 0.004, P = 0.95], and DSRS depression scores [F(1, 14) = 1.39, P = 0.260].

Appendix 5.19

The main effect of Group [F(1, 13) = 0.01, P = 0.997], and Word Type [F(4, 52) = 2.29, P = 0.72] for colour-naming times of children of adults with PTSD and controls (aged under 13 years).

Appendix 5.20

The results of paired sample t-tests across children of adults with PTSD between neutral words and depression-related words [t (8) = 0.09, P = 0.934], neutral and happy words [t (8) = 1.17, P = 0.277], neutral words and trauma-related words [t (8) = 1.20, P = 0.264], neutral and threat words [t (8) = 1.57, P = 0.156], between depressed words and happy words [t (8) = 1.47, P = 0.018], depressed words and trauma-related words [t (8) = 1.51, P = 0.169], happy and trauma-related words [t (8) = 1.83, P = 0.104], and between trauma-related words and threat words [t (8) = 0.27, P = 0.792].

Appendix 5.21

The results of paired sample t-tests across children control subjects between neutral words and depression-related words [t (5) = 0.91, P = 0.403], neutral and happy words [t (5) = 1.71, P = 0.149], neutral and trauma-related words [t (5) = 1.41, P = 0.219], neutral and threat words [t (5) = 1.63, P = 0.163], between depressed words and happy words [t (5) = 0.09, P = 0.93], depressed words and threat words [t (5) = 0.58, P = 0.589], and between happy and threat words [t (5) = 0.61, P = 0.566].

Appendix 5.22

Differences between children of adults with PTSD and controls (aged over 13 years) on age [F(1, 25) = 3.58, P = 0.07], verbal IQ [F(1, 25) = 0.21, P = 0.752], reading ability [F(1, 25) = 0.027, P = 0.871], and RCMAS anxiety scores [F(1, 25) = 3.14, P = 0.089].

Appendix 5.23

The main effect of Group [F(1, 24) = 0.71, P = 0.0409], interaction [F(4, 96) = 1.56, P = 0.19], and Word Type [F(4, 96) = 1.03, P = 0.395] for children of adults with PTSD and controls (aged over 13 years).

Appendix 5.24

Differences between boys and girls of adults with PTSD on age [F(1, 15) = 2.56, P = 0.132], verbal IQ [F(1, 15) = 0.00, P = 1], RCMAS anxiety scores [F(1, 15) = 1.17, P = 0.213], and reading ability [F(1, 15) = 0.1, P = 0.75].

Appendix 5.25

The results of paired sample t-tests across all children of adults with PTSD between neutral words and depression-related words [t (17) = 1.63, P = 0.122], neutral and happy words [t (17) = 0.95, P = 0.349], between depressed words and trauma-related words [t (17) = 1.08, P = 0.293], depressed words and threat words [t (17) = 0.75, P = 0.466], and between trauma-related words and threat words [t (17) = 0.29, P = 0.779].

Appendix 5.26

Diferences between children with PTSD, children of adults with PTSD, and normal controls on age [F(2, 63) = 0.454, P = 0.637], verbal IQ [F(2, 63) = 0.58, P = 0.563], and reading ability [F(2, 63) = 0.322, P = 0.726].

Appendix 6.1 - Physical threat, Social threat, and Depressed words used in the attentional probe dot task.

	Physical Threat	**Neutral**	**Social Threat**	**Neutral**	**Depressed**	**Neutral**
1	Ghost	Noted	Worried	Printing	Lost	Iron
2	Dark	Ball	Faild	Degree	Crying	Mainly
3	Gun	Hill	Silly	Pride	Cross	Knows
4	Dog	Ago	Annoyed	Essay	Bully	Garlic
5	Murder	Morocco	Prople	Than	Death	Clean
6	Fire	Town	Useless	Testing	Miserable	Libraries
7	Cold	Book	Embarrassed	Association	Angry	Older
8	Attacked	Moonlight	Confused	Partner	Sorry	Magic
9	Explosion	Northwest	Shameful	Sheffield	Lonely	Depend
10	Accident	Explore	Teacher	Covered	Sad	Leg
11	Noise	Farmer	Rejected	Memorial	Helpless	Amusing
12	Killed	Visit	Unpleasant	Libraries	Hated	Guest
13	Bomb	fare	Foolish	Driver	Unwanted	Eybrow
14	Kidnapped	Alphabets	Careless	Desirable	Unlike	Grape
15	Spider	Orange	School	Together	Bad	Wall
16	Shark	Hall	Dull	Hats	Friendless	Achievement

Appendix 6.2

Diffrences between PTSD and normal control subjects on age [F(1, 46) = 0.001, P = 0.099], verbal IQ [F(1, 46) = 0.048, P = 0.83], and reading ability [F(1, 46) = 0.61, P = 0.44].

Appendix 6.3

Main effects of Group [F(1, 46) = 2.09, P = 0.155], and Word Type [F(1, 46) = 0.1, p = 0.751] between PTSD patients and controls for social threat and physical threat.

Appendix 6.4

The results of separate ANOVAs for social threat vs. physical threat words across PTSD [F(1, 23) = 1.53, P = 0.228] and control [F(1, 23) = 2.36, P = 0.138] subjects.

Appendix 6.5

Main effects of Group [F(1, 46) = 1.99, P = 0.165], and Word Type [F(1,46) = 0.81, P = 0.372] for physical threat vs. depressed words across PTSD patients and controls.

Appendix 6.6

Main effects of Group [F(1, 46) =0.11, P = 0.744], and Word Type [F(1,46) = 1.43, P = 0.238] for social threat vs. depressed words across PTSD patients and controls.

Appendix 6.7

Two way interaction for Group X Word Type [F(1, 46) = 1.01, P = 0.320], Threat Position X Word Type [F(1, 46) = 0.01, P = 0.920], for Word Type X Probe Position [F(1, 46) = 1.68, P = 0.201]. Three way interaction for Group X Word Type X Probe [F(1, 46) = 0.02, P = 0.889], for word position X Group X Probe [F(1, 46) = 0.46, P = 0.499].

Appendix 6.8

Terms fro Word Type [F(1, 23) = 0.77, P = 0.389], Word Position [F(1, 23) = 0.13, P = 0.726], Probe Position [F(1, 23) = 0.74, P = 0.398], Word Type X Word Position [F(1,

23) = 2.92, P = 0.101], Word X Probe Position [F(1, 23) = 0.17, P = 0.682], and Word Position X Probe Position [F(1, 23) = 2.45, P = 0.131] across PTSD patients.

Differences Word Type [F(1, 23) = 0.27, P = 0.608], Word Position [F(1, 23) = 0.23, P = 0.639], Probe Position [F(1, 23) = 0.29, P = 0.597], Word Type X Word Position [F(1, 23) = 0.17, P = 0.681], Word Type X Probe Position [F(1, 23) = 1.37, P = 0.253], Word Position X Probe Position [F(1, 23) = 0.97, P = 0.335], and Word Type X Word Position X Probe Position [F(1, 23) = 2.10, P = 0.161] across control subjects.

Differences fro Word Position [F(1, 23) = 1.34, P = 0.260], and Probe Position [F(1, 23) = 0.95, P = 0.341] across PTSD patients.

Appendix 6.9

Differences between two subgroups of patients (RTA & PV) on verbal IQ [F(1, 22) = 1.06, P = 0.31], reading ability [F(1, 22) = 0.112, P = 0.74], RCMAS anxiety scores [F(1, 22) = 2.12, P = 0.16], total scores of IES [F(1, 21) = 0.505, P = 0.48], intrusion subscale of IES [F(1, 21) = 0.55, P = 0.47], and avoidance subscale of IES [F(1, 21) = 0.99, P = 0.76].

Appendix 6.10

The main effect of Group [F(1, 23) = 2.78, P = 0.110], interaction [F(1, 22) = .58, P = .456], and Word Type effect [F(1, 22) = 2.73, P = 0.238] for two subgroups of patients (i.e RTA & PV).

Appendix 6.11

Diffrences between two groups of children (aged under 13 years) on age [F(1, 21) = 3.93, P = 0.061] verbal IQ, [F(1, 21) = 0.004, P = 0.95] reading ability,[F(1, 21) = 1.80, P = 0.195], anxiety scale,[F(1,21) = 0.139, P = 0.713], and depression scale [F(1, 21) = 2.62, P = 0.12].

Appendix 6.12

Main effects of Group [$F(1, 20) = 2.41$, $P = 0.136$] and Word Type [$F(1, 10) = 0.92$, $P = 0.361$] for threat bias and depressed bias across subjects under 13 years old.

Appendix 6.13

Differences on psychological measures across subjects over 13 years old on age [$F(1, 22) = 3.11$, $P = 0.092$], verbal IQ [$F(1, 22) = 0.035$, $P = 0.85$], and reading ability [$F(1, 22) = 0.256$, $P = 0.62$].

Appendix 6.14

Main effect of Group [$F(1, 23) = 0.54$, $P = 0.468$], interaction [$F(1, 23) = 0.37$, $P = 0.55$], and Word Type effect [$F(1, 23) = 0.07$, $P = 0.797$] for threat bias scores and depressed bias scores across two groups of subjects over 13 years old.

Appendix 6.15

Differences on psychological measures for age [$F(1, 23) = 0.0001$, $P = 0.991$], verbal IQ [$F(1, 23) = 0.0007$, $P = 0.979$], DSRS depression scores [$F(1, 23) = 0.491$, $P = 0.491$], RCMAS anxiety scores [$F(1, 22) = 2.18$, $P = 0.154$], total scores of IES [$F(1, 22) = 2.67$, $P = 0.117$], and intrusion subscale of IES [$F(1, 21) = 2.22$, $P = 0.152$] across boys and girls with PTSD.

Appendix 6.16

Main effect of Group [$F(1, 21) = 0.30$, $P = 0.589$], interaction [$F(1, 21) = 0.001$, $P = 0.967$], and Word Type effect [$F(1, 21) = 3.17$, $P = 0.089$] for threat bias and depressed bias across boys and girls with PTSD.

Appendix 7.1

List of Recall Words

N	Threat	Sad	Happy	Animal	PTSD
1	Frightened	Names	Birthday	Jaguar	Nightmare
2	Horror	Unloved	Enjoy	Horse	Smash
3	Silly	Moody	Excellent	Leopard	Ambulance
4	Monster	Sick	Pleasant	Crow	Stretcher
5	Confused	Hate	Cake	Camel	Broken
6	Beat	Homeless	Lucky	Squirrel	Accident
7	Cold	Upset	Wonderful	Tortoise	Car
8	madness	Disappointed	Art	Chimpanzee	Crash
9	Stranger	Unhelpful	Terrific	Alligator	Severe
10	Dreadful	Hopeless	Winning	Peacock	Impact
11	Nervous	Unhappy	Joyful	Bear	Trapped
12	Scared	Illness	Computer	Elephant	Scream

List of the Buffer Words for Recognition task

N	THREAT	SAD	HAPPY	ANIMAL	PTSD
1	Noise	Lonely	Love	Zebra	Tears
2	Dark	helpless	Grateful	Parrot	Siren
3	Ghost	Lost	Park	Dinosaur	Speed
4	Horrible	Friendless	Kindness	Donkey	Impact
5	Worried	Crying	Money	Bird	Police
6	Explosion	Funeral	Fishing	Lizard	Danger
7	Stupid	Pollution	Easter	Crocodile	Injured
8	Terrified	Miserable	Pleased	Sparrow	Bandage
9	Bully	Bad	Brilliant	Ant	Blood
10	Petrified	Unwanted	Funfair	Butterfly	Emergency
11	Failed	Blamed	Singing	Chicken	Hospital
12	Kidnap	Sorry	Excited	Kangaroo	Casualty

Appendix 7.2

Differences between two groups (PTSD patients & controls) on age [$F(1, 47) = 0.83$, $P = 0.366$], verbal IQ [$F(1, 47) = 0.0013$, $P = 0.971$], and reading ability [$F(1, 47) = 0.002$, $P = 0.964$].

Appendix 7.3

Main effect of Group [$F(1, 47) = 0.29$, $P = 0.590$], and interaction [$F(4, 188) = 1.63$, $P = 0.169$] for Beta value between PTSD patients and normal controls.

Appendix 7.4

Differences between two sub-group of PTSD patients (RTA & PV) on verbal IQ [$F(1, 23) = 1.03$, $P = 0.321$], reading ability [$F(1, 23) = 0.071$, $P = 0.723$], total score of the Impact of event scale [$F(1, 21) = 1.05$, $P = 0.317$], avoidance sub-scale of the IES [$F(1, 21) = 0.419$, $P = 0.525$], and intrusion sub-scale of the IES [$F(1, 21) = 0.98$, $P = 0.334$].

Appendix 7.5

Main effect of Group [$F(1, 22) = .56$, $P = .461$] and interaction [$F(4, 88) = 1.79$, $P = 0.138$] for recalled words between two sub-groups of PTSD patients involving in the RTA or PV.

Appendix 7.6

Main effect of Group [$F(1, 22) = 0.42$, $P = 0.526$] and interaction [$F(4, 88) = 0.98$, $P = 0.476$] for d' value across two sub-groups of PTSD (RTA & PV). Main effect [$F(1, 22) = 0.61$, $P = 0.444$], interaction [$F(4, 88) = 1.07$, $P = 0.378$], and Word Type effect [$F(4, 88) = 2.13$, $P = 0.084$] for Beta value across two sub-groups of PTSD (RTA & PV).

Appendix 7.7

Differences between the two groups (aged under 13 years) on age [$F(1, 17) = 2.04$, $P = 0.172$], verbal IQ [$F(1, 17) = .427$, $P = .522$], reading ability [$F(1, 17) = .227$, $P = 0.639$], and RCMAS anxiety score [$F(1, 17) = 1.89$, $P = 0.187$].

Appendix 7.8

Differences between the two groups (aged over 13 years) on age [$F(1, 24) = 1.9$, $P = 0.180$], vebal IQ [$F(1, 24) = 0.57$, $P = 0.455$], and reading ability [$F(1, 24) = 0.78$, $P = 0.544$].

Appendix 7.9

Main effect of Group [$F(1, 17) = 3.07$, $P = .098$], and interaction [$F(4, 68) = .62$, $P = .647$] for recall memory across PTSD patients and normal controls (aged under 13 years).

Appendix 7.10

Main effects of Group for d'[$F(1, 18) = .65$, $P = .432$], or Beta [$F(1, 18) = .00$, $P = .985$], and interaction for d' [$F(4, 68) = 2.02$, $P = .101$] or Beta [$F(4, 68) = 1.04$, $P = .395$], or Word Type effect for Beta [$F(4, 68) = 1. 38$, $P = 0.250$] values across PTSD and normal controls under 13 years old.

Appendix 7.11

Main effect of Group for d'[$F(1, 28) = 0.49$, $P = 0.490$], for Beta [$F(1, 28) = 0.46$, $P = 0.501$]values, interaction for d' [$F(4, 112) = 1.32$, $p = 0.265$] and for Beta [$F(4, 112) = 1.48$, $P = 0.213$] across adolescents with PTSD and controls.

Appendix 7.12

Differences between girls and boys on age [$F(1, 23) = .015$, $P = .904$], verbal IQ [$F(1, 23) = .0004$, $P = 0.985$], depression scores [$F(1, 23) = 1.47$, $P = 0.237$].

Appendix 7.13

Main effect of [$F(1, 22) = 0.2.37$, $P = 0.138$] and interaction [$F(4, 88) = 1.20$, $P = 0.315$] for boys and girls with PTSD.

Appendix 7.14

Main effect for ***d'***[$F(1, 22) = 1.68$, $P = 0.208$], for ***Beta*** [$F(1, 22) = 1.13$, $P = 0.3$], and interaction for ***d'*** [$F(4, 88) = .34$, $P = 0.850$] and for ***Beta*** [$F(4, 88) = .37$, $P = .827$] values across boys and girls with PTSD.

Appendix 7.15

Differences between children of adults with PTSD and controls on age [$F(1, 42) = 0.67$, $P = 0.415$], verbal IQ [$F(1, 42) = 0.854$, $P = 0.361$], reading ability [$F(1, 42) = 0.0013$, $P = 0.971$], and anxiety scale [$F(1, 42) = 1.28$, $P = 0.264$].

Appendix 7.16

Differences between children of adults with PTSD and controls of false memory [$F(1, 42) = 1.22$, $P = 0.273$], and total memory [$F(1, 42) = 0.486$, $P = 0.490$].

Appendix 7.17

Main effect of [$F(1, 41) = 0.92$, $P = 0.344$] and interaction [$F(4,164) = 1.44$, $P = 0.224$]

on recall memory between children of adults with PTSD and normals.

Appendix 7.18

Main effect of [$F(1, 41) = 1.91$, $P = 0.175$] and interaction for d' value [$F(4, 164) = 1.64$, $P = 0.167$] between children of adults with PTSD and controls.

Appendix 7.19

Main effect of [$F(1, 41) = 0.23$, $P = 0.638$] and interaction [$F(4, 164) = 0.52$, $P = 0.724$] for Beta value between children of adults with PTSD and controls.

Appendix 7.20

Main effect of [$F(2, 64) = 2.50$, $P = 0.09$] and interaction [$F(8, 256) = 1.47$, $P = 0.169$] on the recalled words for children with PTSD, children of adults with PTSD and controls.

Appendix 7.21

Main effects of Group for ***d'*** [$F(2, 64) = 0.79$, $P = 0.458$] and ***Beta*** [$F(2, 64) = 0.46$, $P = 0.634$] and interactions for ***d'*** [$F(8, 256) = 1.40$, $P = 0.197$] and ***Beta*** [$F(8, 256) = 1.15$, $P = =0.331$] values across three groups: Children with PTSD, children of adults with PTSD and normal controls.

Appendix 8.1

Differences between PTSD patients and normal controls on age [F (1, 38) = 0.01, P = 0.89] and verbal IQ [F (1, 38) = 0.38, P = 0.54].

Appendix 8.2

Differences between PTSD patients with RTA and PV trauma on verbal IQ [F(1, 16) = 1.20, P = 0.29], reading ability [F(1, 16) = 1.62, P = 0.222], IES [F(1, 16) = 1.07, P = 0.318], Avoidance [F(1, 16) = 0.95, P = 0.344], Intrusion [F(1, 16) = 1, P = 0.332], and anxiety [F(1, 16) = 3.56, P = 0.08].

Appendix 8.3

Differences between PTSD patients with RTA and PV trauma on appointment [F(1, 16) = 1.94, P = 1.84], belonging [F(1, 16) = 0.0044, P = 0.948], date [F(1, 16) = 1.16, P = 0.298], face recognition [F(1, 16) = .513, P = 0.485], first name and second name [F(1, 16) = 0.0303, P = 0.864], message delivery [F(1, 16) = 0.16, P = 0.901], orientation [F(1, 16) = 0.112, P = 0.743], picture recognition [F(1, 16) = 2.48, P = 0.136], prospective [F(1, 16) = 0.432, P = 0.521], route delayed [F(1, 16) = 2.93, P = 0.168], route immediate [F(1, 16) = 0.247, P = 0.626], story delayed [F(1, 16) = 0.80, P = 0.781], story immediate [F(1, 16) = 0.422, P = 0.523], and total score [F(1, 16) = 0.16, P = 0.90].

Appendix 8.4

Differences between PTSD patients and controls (aged under 14 years) on age [F(1, 13) = 3.78, P = 0.076], self reported anxiety [F(1, 13) = 1.09, P = 0.317], verbal IQ [F(1, 13) = 0.079, P = 0.78], depression [F(1, 13) = 0.12, P = 0.75], and reading ability [F(1, 13) = 1.81, P = 0.203].

Appendix 8.5

Diffrences between PTSD patients and controls (aged under 14 years) on appointment [F(1, 13) = 2.87, P = 0.116], belonging [F(1, 13) = 0.38, P = 0.549], date [F(1, 13) = 1.04, P = 0.327], first name and second name [F(1, 13) = 1.94, P = 0.188], orientation

[F(1, 13) = 1.28, P = 0.278], picture recognition [F(1, 13) = 1.37, P = 0.264], prospective [F(1, 13) = 1.65, P = 0.223], route delayed [F(1, 13) = 0.81, P = 0.386], route immediate [F(1, 13) = 0.042, P = 0.84], and story delayed [F(1, 13) = 0.94, P = 0.112].

Appendix 8.6

Differences between PTSD patients and controls (aged over 14 years) on age [F(1, 25) = 0.776, P = 0.387], and verbal IQ [F(1, 25) = 0.339, P = 0.566].

Appendix 8.7

Differences between PTSD patients and controls (aged over 14 year) on date [F(1, 25) = 1.9, P = 0.181], face recognition [F(1,25) = 0.45, P = 0.51, first name and second name [F(1, 25) = 1.09, P = 0.306], orientation [F(1, 13) = 1.28, P = 0.278], picture recognition [F(1, 25) = 3.89, P = 0.06], route delayed [F(1, 25) = 1.55, P = 0.224], route immideate [F(1, 25) = 0.54, P = 0.469], story delayed [F(1, 25) = 2.58, P = 0.121] and story immediate [F(1, 25) = 1.75, P = 0.198]..

Appendix 8.8

Differences between boys and girls with PTSD on age [F(1, 17) = 0.48, P = 0.497, anxiety [F(1, 17) = 1.76, P = 0.202], verbal IQ [F(1, 17) = 0.199, P = 0.661], reading ability [F(1, 17) = 0.002, P = 0.966], depression [F(1, 17) = 0.697, P = 0.416], IES [F(1, 17) = 4.09, P = 0.614], Avoidance [F(1, 17) = 4.01, P = 0.064], and Intrusion [F(1, 17) = 3.32, P = 0.088].

Appendix 8.9

Differences between boys and girls with PTSD on belonging [F(1, 17) = 1.74, P = 0.206], date [F(1, 17) = 0.753, P = 0.2398], face recognition [F(1, 17) = 0.667, P = 0.426], first name and second name [F(1, 17) = 3.09, P = 0.98], message delevery [F(1, 17) = 1.94, P = 0.183], orientation [F(1, 17) = 0.886, P = 0.36], picture recognition [F(1, 17) = 1.36, P = 0.261], route delayed [F(1, 17) = 0.627, P = 0.044], route immediate [F(1, 17) = 0.667, P = 0.426], story delayed [F(1, 17) = 0.317, P = 0.861], story immediate [$F(1, 17) = 1.82$, $P = 0.196$], and total score [$F(1, 17) = 0.131$, $P = 0.722$].

The Depression Self-Rating Scale

(DSRS; Birleson, 1981)

Name ....   Sex: Boy / Girl

HOW I FEEL

DIRECTION:

Please answer as honestly as you can. The statements refer to how you have felt over the past week. There are no right or wrong answers. It is important to say how you have felt. Put one tick for each statement.

	Most	Sometimes	Never
1. I look forward to things as much as I used to	....	....	....
2. I sleep very well.	....	....	....
3. I feel like crying.	....	....	....
4. I feel like going out to play.	....	....	....
5. I feel like running away.	....	....	....
6. I get tummy aches.	....	....	....
7. I have lots of energy.	....	....	....
8. I enjoy my food.	....	....	....
9. I can stick up for myself.	....	....	....
10. I think life is not worth living.	....	....	....
11. I am good at things I do.	....	....	....
12. I enjoy the things I do as much as I used to.	....	....	....
13. I like talking with my family.	....	....	....
14. I have horrible dreams.	....	....	....
15. I feel very lonely.	....	....	....
16. I am easily cheered up.	....	....	....
17. I feel so sad I can hardly stand it.	....	....	....
18. I feel very bored.	....	....	....

Thank you

The Revised Children's Manifest Anxiety Scale (RCMAS)

(Reynolds Richmond, 1978)

How I Think And Feel

1. I have trouble making up my mind	Yes	No
2. I get nervous when things do not go the right way for me	Yes	No
3. Others seem to do things easier than I can	Yes	No
4. I like everyone I know	Yes	No
5. Often I have trouble getting my breath	Yes	No
6. I worry a lot of the time	Yes	No
7. I am afraid of a lot of things	Yes	No
8. I am always kind	Yes	No
9. I get mad easily	Yes	No
10. I worry about what my parents will say to me	Yes	No
11. I feel that others do not like the way I do things	Yes	No
12. I always have good manners	Yes	No
13. It is hard for me to get to sleep at night	Yes	No
14. I worry about what other people think about me	Yes	No
15. I feel alone even when there are people with me	Yes	No
16. I am always good	Yes	No
17. Often I feel sick in my stomach	Yes	No
18. My feelings get hurt easily	Yes	No
19. My hands feel sweaty	Yes	No
20. I am always nice	Yes	No
21. I am tired a lot	Yes	No
22. I worry about what is going to happen	Yes	No
23. Other people are happier than I	Yes	No
24. I tell the truth every single time	Yes	No
25. I have bad dreams	Yes	No
26. My feelings get hurt easily when I am fussed at	Yes	No
27. I feel someone will tell me I do things the wrong way	Yes	No
29. I never get angry	Yes	No
30. I wake up scared some of the time	Yes	No
31. I worry when I go to bed at night	Yes	No
32. It is hard for me to keep my mind on my school work	Yes	No
33. I never say things I shouldn't	Yes	No
34. I wiggle in my seat a lot	Yes	No
35. I am nervous	Yes	No
36. A lot of people are against me	Yes	No
37. I never lie	Yes	No
38. I often worry about something bad happening to me	Yes	No

NAME : ______________________ DATE: ______________

REVISED IMPACT OF EVENTS SCALE

On ______________ you experienced ______________________

Below is a list of comments made by people after stressful life events. Please check each item, indicating how frequently these comments were true for you **DURING THE PAST SEVEN DAYS**. If they did not occur during that time, please mark the "not at all" column.

FREQUENCY

Comment	Not at all	Rarely	Sometimes	Often
1. I thought about it when I didn't mean to				
2. I avoided letting myself get upset when I thought about it or was reminded of it				
3. I tried to remove it from memory.				
4. I had trouble falling asleep or staying asleep because of pictures or thoughts about it that came into my mind				
5. I had waves of strong feeling about it.				
6. I had dreams about it.				
7. I stayed away from reminders of it.				
8. I felt as if it hadn't happened or it wasn't real.				
9. I tried not to talk about it.				
10. Pictures about it popped into my mind.				
11. Other things kept making me think about it.				
12. I was aware that I still had a lot of feelings about it, but I didn't deal with them.				
13. I tried not to think about it				
14. Any reminder brought back feelings about it.				
15. My feelings about it were kind of numb.				